PTO/SB/084(10-01)
Approved for use through 10/31/2002, CMS 651-0031
US Pases & Tradement Office: U.S. DEPARTMENT OF COMMERCE

| Substitute for form 1449APTO | Under the Pepervork Reduction Act of 1995, no persons are required to respond to a collection of information untess it contains a valid OMS control number. Complete if Known | | | |
|------------------------------|--|-----------------|--|--|
| INFORMATION DISCLOSURE | Application Number | 09/945,535 | | |
| STATEMENT BY APPLICANT | Filing Date | August 30, 2001 | | |
| | First Named Inventor | Ahn, Kie | | |
| FER 1 A TOUTS AND | Group Art Unit | 2813 | | |
| | Examiner Name | Blum, David | | |
| Sheet of 1 | Attorney Docket No: 1303.026US1 | | | |

| | | US PATE | NT DOCUMENTS | | |
|-----------------------|--|---------------------|---|-------------------------------|--|
| Examiner Initial * | USP Document Number | Publication Date | Name of Patentee or Applicant of cited Document | Filing Date If Appropriate | |
| 1/52 | US-2002/0094632-A1 07/18/2002 Agarwal, V. K., et al. | | Agarwal, V. K., et al. | 01/15/2002 | |
| | US-2003/0124794-A1 | 07/03/2003 | Girardie, Lionel | 12/13/2002 | |
| | US-2003/0193061-A1 | 10/16/2003 | Osten, Hans-Joerg | 06/05/2003 | |
| | US-2003/0235961-A1 | 12/25/2003 | Metzner, C., et al. | 04/04/2003 | |
| | US-2004/0222476-A1 | 11/11/2004 | | | |
| 1 | US-2004/0262700-A1 | 12/30/2004 | Ahn, K. Y., et al. | 06/24/2003 | |
| | US-2005/0020017-A1 | 01/27/2005 | Ahn, K. Y., et al. | 06/24/2003 | |
| | US-5,745,334 | 04/28/1998 | Hoffarth, Joseph G., et al. | 03/25/1996 | |
| | US-5,912,797 | 06/15/1999 | Schneemeyer, L. F., et al. | 09/24/1997 | |
| | US-6,154,280 | 11/28/2000 | Borden, P. G. | 12/02/1998 | |
| | US-6,258,637 | 07/10/2001 | Wilk, G. D., et al. | 12/02/1999 | |
| | US-6,518,634 | 02/11/2003 | Kaushik, V. S., et al. | 09/01/2000 | |
| | US-6,674,138 | 01/06/2004 | Halliyal, A., et al. | 12/31/2001 | |
| | US-6,767,795 | 07/27/2004 | Ahn, K. | 01/17/2002 | |
| | US-6,821,862 | 11/23/2004 | Cho, Hag-Ju | 06/27/2001 | |
| / | US-6,821,873 | 11/23/2004 | Visokay, M. R., et al. | 06/28/2002 | |
| ¥ | US-6,844,203 | 01/18/2005 | Ahn, K. Y., et al. | 08/30/2001 | |

| | FOREIGN PATENT DOCUMENTS | | | | | |
|-----------------------|--------------------------|------------------|---|----|--|--|
| Examiner Initials* | Foreign Document No | Publication Date | Name of Patentee or Applicant of cited Document | T² | | |
| D59 | EP-0540993A1 | 05/12/1993 | Argos, Jr., G., et al. | | | |
| + | EP-1324376A1 | 07/02/2003 | Girardie, L. | | | |

| | OTHE | R DOCUMENTS NON PATENT LITERATURE DOCUMENTS | |
|-----------------------|-------------------------|---|----|
| Examiner Initials* | Cite No ¹ | Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published. | T' |
| D37 | | HOSHINO, Y., et al., "Characterization and Control of the HfO2/Si(001) Interfaces", Applied Physics Letters, 81, (Sep. 30, 2002), 2650-2652 | |
| 1 | | WOLF, S., et al., Silicon Processing for the VLSI Era Vol. 4: Deep- Submicron Process Technology, Lattice Press, Sunset Beach, CA, (2002), p. 98, 146, 173-174 | |

EXAMINER DATE CONSIDERED 3/7/05

PTO/SB/08A(10-01)
Approved for use through 10/31/2002. Oate 65-10031
US Patent & Trademan Ome: U.S. DEPARTENT OF CROADERCE
Inder the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Complete If Known Substitute for form 1449A/PTO Complete if Known INFORMATION DISCLOSURE **Application Number** 09/945535 **EATEMENT BY APPLICANT** August 30, 2001 Filing Date **First Named Inventor** Ahn, Kie **Group Art Unit** 2813 4 2005 FEB **Examiner Name** Blum, David Attorney Docket No: 1303.026US1 1 of 3

| | | US P | ATENT DOCUMENT | S | | |
|--------------------|------------------------|------------------|--|-------|----------|----------------------------|
| Examiner Initial * | USP Document Number | Publication Date | Name of Patentee or Applicant of cited Document | Class | Subclass | Filing Date If Appropriate |
| 057 | US- 2002/0089023 | 07/11/2002 | Yu, Z., et al. | 257 | 411 | 01/05/2001 |
| | US- 2002/0155688 | 10/24/2002 | Ahn, K. Y., et al. | 438 | 592 | 04/20/2001 |
| | US- 2002/0155689 | 10/24/2002 | Ahn, K. Y., et al. | 29 | 76 | 02/11/2002 |
| | US- 2002/0192974 | 12/19/2002 | Ahn, Kie, et al. | 438 | 722 | 06/13/2001 |
| | US- 2003/0017717 | 01/23/2003 | Ahn, Kie, et al. | 438 | 768 | 07/18/2001 |
| | US-4,215,156 | 07/29/1980 | Dalal, H., et al. | 427 | 84 | 08/26/1977 |
| | US-4,399,424 | 04/16/1983 | Rigby, L. J. | 338 | 34 | 10/05/1981 |
| | US-5,822,256 | 10/13/1998 | Bauer, Mark , et al. | 365 | 200 | 03/05/1997 |
| | US-5,828,080 | 10/27/1998 | Yano, Y., et al. | 257 | 43 | 04/17/1995 |
| | US-6,013,553 | 01/11/2000 | Wallace, Robert , et al. | 438 | 287 | 07/15/1998 |
| | US-6,171,900 | 01/09/2001 | Sun, Shi-Chung | 438 | 240 | 04/15/1999 |
| | US-6,225,168 | 05/01/2001 | Gardner, Mark, et al. | 438 | 287 | 06/04/1998 |
| | US-6,297,539 | 10/02/2001 | Ma, Y., et al. | 257 | 410 | 07/06/2000 |
| | US-6,303,481 | 10/16/2001 | Park, Dong | 438 | 591 | 12/29/2000 |
| | US-6,368,941 | 04/09/2002 | Chen, Tai-Ju, et al. | 438 | 424 | 11/08/2000 |
| | US-6,465,334 | 10/15/2002 | Buynoski, Matthew S., et al. | 438 | 591 | 10/05/2000 |
| | US-6,495,436 | 12/17/2002 | Ahn, Kie, et al. | 438 | 591 | 02/09/2001 |
| \bigvee | US-6,521,911 | 02/18/2003 | Parsons, Gregory N., et al. | 257 | 52 | 07/19/2001 |

| | FOREIGN PATENT DOCUMENTS | | | | | | | |
|-----------------------|---|--|--|--|--|--|--|--|
| Examiner Initials* | | | | | | | | |
| Ps | Ps- JP-2001-332546 11/30/2001 H01L 21/316 | | | | | | | |

| | OTHE | R DOCUMENTS NON PATENT LITERATURE DOCUMENTS | |
|-----------------------|--------------|---|---|
| Examiner Initials* | Cite No 1 | Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published. | T |
| 0- | | International Technology for Semiconductor Roadmap, (1999), | 7 |
| | | BRIGHT, A A., et al., "Low-rate plasma oxidation of Si in a dilute oxygen/helium plasma for low-temperature gate quality Si/Sio2 interfaces", <u>Applied Physics</u> Letters, (February 1991), pp. 619-621 | |
| | | | 十 |

3/7/05 **EXAMINER DATE CONSIDERED**

PTO/SE/084(10-01)
Approved for use through 10/31/2002, OMB 651-0031
US Patent & Trademark Office: U.S. DEPARTMENT OF COMMERCE

| Substitute for form 1449A/PTO | Under the Paperwork Reduction Act of 1965, no persons are required to respond to a collection of information untess it contains a valid OMB control number (Complete if Known | | |
|---|--|-----------------|--|
| INFORMATION DISCLOSURE STATEMENT BY APPLICANT | Application Number | 09/945535 | |
| (Use as many sheets as necessary) | Filing Date | August 30, 2001 | |
| | First Named Inventor | Ahn, Kie | |
| YOL | Group Art Unit | 2813 | |
| COL | Examiner Name | Blum, David | |
| Sheet 2 of 3 | Attorney Docket No: 1 | 303.026US1 | |

| Examiner | Cite | R DOCUMENTS NON PATENT LITERATURE DOCUMENTS Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item | T |
|---------------------|---------------------------------|---|---|
| Initials* | No ¹ | (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published. | |
| | | CHENG, BAOHONG, et al., "The Impact of High-k Gate Dielectrics and Metal | Π |
| nka 1 | | Gate Electrodes on Sub-100nm MOSFET's", IEEE Transactions on Electron | |
| 18 | | Devices, (1999), pp. 1537-1544 | ı |
| | | FUYUKI, TAKASHI, et al., "Initial stage of ultra-thin SiO2 formation at low | |
| | | temperatures using activated oxygen", Applied Surface Science, (1997), pp. | İ |
| | | 123-126 | l |
| | | HIRAYAMA, MASAKI, et al., "Low-Temperature Growth of High-Integrity Silicon | Г |
| | | Oxide Films by Oxygen Radical Generated in High Density Krypton Plasma", | 1 |
| | | IEDM Technical Digest, (1999), pp. 249-252 | |
| 1 | | HUBBARD, K. J., et al., "Thermodynamic stability of binary oxides in contact with | |
| | | silicon", J. Mater. Res., (11/1996), pp. 2757-2776 | |
| | | JEONG, CHANG-WOOK, et al., "Plasma-Assisted Atomic Layer Growth of | |
| 1 1 | | High-Quality Aluminum Oxide Thin Films", Japanese Journal of Applied Physics, | |
| | ~ | (January 2001), pp. 285-289 | |
| | | KAWAI, Y, et al., "Ultra-low-temperature growth of high-integrity gate oxide films | |
| [[| | by low-energy Ion-assisted oxidation", Applied Physics Letters, (April 1994), pp. | |
| | | 2223-2225 | |
| | | KIM, C T., et al., "Application of Al2O3 Grown by Atomic Layer Deposition to | Π |
| - | | DRAM and FeRAM", International Symposium in Integrated Ferroelectrics, | |
| | | (March 2000), pp. 316 | |
| | | KIM, Y, et al., "Substrate dependence on the optical properties of Al2O3 films | |
| | | grown by atomic layer deposition", Applied Physics Letters, (December 1997), | |
| | · · · · · · · · · · · · · · · · | pp. 3604-3606 | |
| | | LESKELA, M, et al., "ALD precursor chemistry: Evolution and future | |
| | | challenges", Journal de Physique, (1999), pp. 837-852 | |
| | | LIU, C. T., "Circuit Requirement and Integration Challenges of Thin Gate | |
| | | Dielectrics for Ultra Small MOSFETs", IEDM, (1998), pp. 747-750 | |
| | | LIU, Y C., et al., "Growth of ultrathin SiO2 on Si by surface irradiation with an | |
| | | O2+Ar electron cyclotron resonance microwave plasma at low temperatures", | |
| | | Journal of Applied Physics, (February 1999), pp. 1911-1915 | |
| | | MARTIN, P J., et al., "Ion-beam-assisted deposition of thin films", Applied Optics, | Γ |
| \perp | | (January 1983), pp. 178-184 | |
| | | MULLER, D. A., et al., "The electronic structure at the atomic scale of ultrathin | |
| | | gate oxides", Nature, vol.399, no.6738, 24 June 1999, (1999), pp. 758-61 | L |
| 1 1 | | NIEMINEN, MINNA, et al., "Formation and stability of lanthanum oxide thin films | |
| | | deposited from B-diketonate precursor", Applied Surface Science, (2001), pp. | |
| 1 | | 155-165 | L |
| V / 1 | | OSTEN, H. J., et al., "High-k Gate Dielectrics with Ultra-low Leakage Current | |
| $V \longrightarrow$ | | Based on Praseodymium Oxide", IEEE, (2000), pp. 653-656 | |
| · | | PAN, TUNG M., et al., "High Quality Ultrathin CoTiO3 High-k Gate Dielectrics", | |
| _ | | Electrochemical and Solid-State Letters, (2000), pp. 433-434 | |

EXAMINER DATE CONSIDERED 3/2/65

PTO/SB/08A(10-01)
Approved for use through 10/31/2002, OMB 651-0031
US Prismt & Trademier Office; U.S. DEPARTMENT OF COMMERCE
ction of information unless it oversing a unit of the

| Substitute for form 1449A/PTO | Complete if Known | required to respond to a collection of information unless it contains a valid CARS control number |
|---|-----------------------|---|
| INFORMATION DISCLOSURE STATEMENT BY APPLICANT | Application Number | 09/945535 |
| (Use as many sheets as necessary) | Filing Date | August 30, 2001 |
| | First Named Inventor | Ahn, Kie |
| ر ن | Group Art Unit | 2813 |
| l O | Examiner Name | Blum, David |
| Sheet 3 of 3 | Attorney Docket No: 1 | 303.026US1 |

| | | OTHER | R DOCUMENTS NON PATENT LITERATURE DOCUMENTS | | | |
|------------|-----------------|--------------|---|--|--|--|
| | miner tlais* | Cite No 1 | Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published. | | | |
| Pr | Do | | PAN, TUNG M., et al., "High-k cobalt-titanium oxide dielectrics formed by oxidation of sputtered Co/Ti or Ti/Co films", <u>Applied Physics Letters</u> , (March 2001), pp. 1439-1441 | | | |
| | | | QI, WEN-JIE, et al., "MOSCAP and MOSFET characteristics using Zr02 gate dielectric deposited directly on Si", <u>IEDM Technical Digest</u> , (1999), pp. 145-148 | | | |
| | | | SAITO, YUJI, et al., "Advantage of Radical Oxidation for Improving Reliability of Ultra-Thin Gate Oxide", 2000 Symposium on VLSI Technology Digest of Technical Papers, (2000), pp. 176-177 | | | |
| | | | SAITO, YUJI, et al., "High-Integrity Silicon Oxide Grown at Low-Temperature by Atomic Oxygen Generated in High-Density Krypton Plasma", Extended Abstracts of the 1999 International Conference on Solid State Devices and Materials, (1999), pp. 152-153 | | | |
| | | | SHIN, CHANG H., et al., "Fabriation and Characterization of MFISFET using Al2O3 Insulating Layer for Non-Volatile Memory", 12th International Symposium in Integrated Ferroelectrics, (March 2000), pp. 1-9 | | | |
| $\vdash +$ | | | SZE, S M., Physics of Semiconductor Devices, (1981), p. 431 SZE, S M., Physics of Semiconductor Devices, (1981), p. 473 | | | |
| | · / | | WOLF, STANLEY, et al., "Silicon Processing for the VLSI Era - Volume I: Process Technology", Second Edition, Lattice Press, Sunset Beach, California, (2000), page 443 | | | |

EXAMINER DATE CONSIDERED 3/1/05

PTO/SB/08A(08-03)
Approved for use through 07/31/2006, QMB 0851-0031
tent & Tredemark Office: U.S. DEPARTMENT OF COMMERCE

er the Paperwork Raduction Act of 1996, no persons are required to n Complete if Known Substitute for form 1449A/PTO INFORMATION DISCLOSURE 09/945,535 **Application Number** STATEMENT BY APPLICANT Filing Date August 30, 2001 Ahn, Kie **First Named Inventor** 2813 NOV 1 5 2004 **Group Art Unit Examiner Name** Blum, David Attorney Docket No: 1303.026US1 Sheet 1 of 1

| | | US PAT | ENT DOCUMENTS | | | | |
|---|--------------------|------------|----------------------|--|--|--|--|
| Examiner USP Document Number Publication Name of Patentee or Applicant Pages, Columns, Lines, Where Relevant Initial Date of cited Document Passages or Relevant Figures Appear | | | | | | | |
| abr | US-2004/0214399-A1 | 10/28/2004 | Ahn, K. Y., et al. | | | | |
| | US-6,586,349 | 07/01/2003 | Jeon, J. S., et al. | | | | |
| V | US-6,740,605 | 05/25/2004 | Shiraiwa, H., et al. | | | | |

| FOREIGN PATENT DOCUMENTS | | | | | |
|--------------------------|---------------------|------------------|---|--|----|
| Examiner Initials* | Foreign Document No | Publication Date | Name of Patentee or Applicant of cited Document | Pages,Columns,Lines, Where Relevant Passages or Relevant Figures Appear | T² |

| | OTHER | R DOCUMENTS NON PATENT LITERATURE DOCUMENTS | |
|-----------------------|--------------|---|----|
| Examiner Initials* | Cite No 1 | Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published. | Τ² |

EXAMINER /5

DATE CONSIDERED

3/1/05

PTO/SB7884 (10-01)
Approved for use through 10/31/2022, QMB 651-0031
US Patent & Trademark Office; U.S. DEPARTMENT OF COMMERCE

| Substitute for form 1449A/PTO | Complete if Known | required to respond to a collection of information unless it contains a valid QMB control number. |
|--|-----------------------|---|
| INFORMATION DISCLOSURE STATEMENT BY APPLICANT | Application Number | 09/945535 |
| (Use as many sheets as necessary) | Filing Date | August 30, 2001 |
| | First Named Inventor | Ahn, Kie |
| | Group Art Unit | 2813 |
| | Examiner Name | Blum, David |
| Sheet 1 of 1 | Attorney Docket No: 1 | 303.026US1 |

| | | USI | PATENT DOCUMENT | S | | |
|--------------------|------------------------|------------------|---|-------|----------|----------------------------|
| Examiner Initial * | USP Document Number | Publication Date | Name of Patentee or Applicant of cited Document | Class | Subclass | Filing Date If Appropriate |
| | US- 2001/0009695 | 07/26/2001 | Saanila, Ville A., et al. | A27 | 255.39 | 01/18/2001 |
| | US- 2002/0146916 | 10/10/2002 | Irino, Kiyoshi, et al. | 438 | 785 | 03/29/2002 |
| · | US- 2003/0175411 | 09/18/2003 | Kodas, T. T., et al | 427 | 58 | 10/04/2002 |
| | US-6,093,944 | 07/25/2003 | VanDover, R B | 257 | 310 | 06/04/1998 |
| | US-6,451,695 | 09/17/2002 | Sneh, O. | 438 | 685 | 12/22/2000 |
| | US-6,602,338 | 08/05/2003 | Chen, S., et/al. | 106 | 287.19 | 04/11/2001 |

| | | FOREIGN PATE | NT DOCUMENTS | | | |
|-----------------------|---------------------|------------------|--|-------|----------|----|
| Examiner Initials* | Foreign Document No | Publication Date | Name of Patentee or Applicant of cited Document | Class | Subclass | T² |

| | OTHE | R DOCUMENTS NON PATENT LITERATURE DOCUMENTS | _ |
|-----------------------|-------------------------|--|----|
| Examiner Initials* | Cite No ¹ | Include name of the author (if CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal/serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published. | T² |
| | | CHAMBERS, J J., et al., "Physical and electrical characterization of ultrathin yttrium silicate insulators on silicon", <u>Journal of Applied Physics</u> , 90(2), (July 15, 2001), 918-33 | |
| | | KUKLI, KAUPO, et al., "Low-Temperature Deposition of Zirconium Oxide-Based Nanocrystalline Films by Alternate Supply of Zr[OC(CH3)3]4 and H2O", Chemical Vapor Deposition, 6(6), (2000), 297-302 | |
| | | NAKAJIMA/ANRI, "Soft breakdown free atomic-layer-deposited silicon- nitride/SiO/sub 2/ stack gate dielectrics", <u>International Electron Devices Meeting.</u> <u>Technical Digest</u> , (2001), 6.5.1-4 | |
| | | RAHTU/ANTTI, et al., "Atomic Layer Deposition of Zirconium Titanium Oxide from Titanium Isopropoxide and Zirconium Chloride", Chemistry of Materials, 13(5)/(May 2001), 1528-1532 | |
| | | WOLF, S., et al., In: Silicon Processing of the VLSI Era, Vol. 1, Lattice Press, 374-380 | |

Previously Considere O

EXAMINER

DATE CONSIDERED

Substitute for form 1449A/PTO INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Use as many sheets as necessary)



| Application Number | 09/945,535 |
|---------------------------|-----------------|
| Filing Date | August 30, 2001 |
| First Named Inventor | Ahn, Kie |
| Group Art Unit | 2813 |
| Examiner Name | Blum, David |

Sheet 1 of 4

| | | US PAT | TENT DOCUMENTS | | | |
|-----------------------|---------------------|---------------------|---|-------|----------|----------------------------|
| Examiner Initial * | USP Document Number | Publication Date | Name of Patentee or Applicant of cited Document | Class | Subclass | Filing Date If Appropriate |
| DSP | US-2001/0002280 | 05/31/2001 | Sneh, Ofer | 427 | 255.28 | 12/22/2000 |
| 7 | US-2001/0042505 | 11/22/2001 | Vaartstra, Brian A. | 117 | 104 | 07/18/2001 |
| | US-2002/0192974 | 12/19/2002 | Ahn, Kie Y., et al. | 438 | 722 | 06/13/2001 |
| | US-2002/0001971 | 01/03/2002 | Cho, Hag-ju | 438 | 765 | 06/27/2001 |
| | US-2002/0086507A1 | 07/04/2002 | Park, Dae G., et al. | 438 | 585 | 12/26/2001 |
| | US-2002/0111001 | 08/15/2002 | Ahn, Kie Y., et al. | 438 | 592 | 02/09/2001 |
| | US-2003/0001212 | 01/02/2003 | Hu, Yongjun , et al. | 257 | 388 | 08/29/2002 |
| | US-2003/0003702 | 01/02/2003 | Ahn, Kie Y., et al. | 438 | 591 | 08/26/2002 |
| | US-2003/0003722 | 01/02/2003 | Vaartstra, Brian A. | 438 | 656 | 08/19/2002 |
| | US-2003/0042526 | 03/06/2003 | Weimer, Ronald A. | 257 | 309 | 08/29/2001 |
| | US-2003/0052356 | 03/20/2003 | Yang, Haining , et al. | 257 | 309 | 10/11/2002 |
| | US-2003/0052358 | 03/20/2003 | Weimer, Ronald A. | 257 | 310 | 10/25/2002 |
| | US-2003/0102501 | 06/05/2003 | Yang, Haining , et al. | 257 | 295 | 12/12/2002 |
| | US-2003/0119313 | 06/26/2003 | Yang, Haining , et al. | 438 | 681 | 12/05/2002 |
| | US-2003/0157764 | 08/21/2003 | Ahn, Kie Y., et al. | 438 | 212 | 02/20/2002 |
| | US-2003/0207593A1 | 11/06/2003 | Derderian, G. J., et al. | 438 | 778 | 05/02/2002 |
| | US-2003/0222300 | 12/04/2003 | Basceri, Cem, et al. | 257 | 309 | 03/13/2003 |
| | US-2003/0224600A1 | 12/04/2003 | Cao, W., et al. | 438 | 684 | 03/04/2003 |
| | US-2003/0228747 | 12/11/2003 | Ahn, Kie Y., et al. | 438 | 591 | 06/05/2002 |
| | US-2003/0232511A1 | 12/18/2003 | Metzner, C. R., et al. | 438 | 785 | 09/19/2002 |
| | US-2004/0033681 | 02/19/2004 | Ahn, Kie Y., et al. | 438 | 591 | 08/15/2002 |
| | US-2004/0033701A1 | 02/19/2004 | Ahn, K. Y., et al. | 438 | 785 | 08/15/2002 |
| | US-2004/0038525A1 | 02/26/2004 | Meng, S., et al. | 438 | 656 | 08/26/2002 |
| | US-2004/0043557 A1 | 03/04/2004 | Haukka et al. | 438 | 240 | 09/02/2003 |
| | US-2004/0065255A1 | 04/08/2004 | Yang, M. X., et al. | 118 | 715 | 01/31/2003 |
| | US-2004/0087124A1 | 05/06/2004 | Kubota, M., et al. | 438 | 591 | 09/16/2003 |
| | US-2004/0099889A1 | 05/27/2004 | Frank, M. M., et al. | 257 | 288 | 11/27/2002 |
| | US-4,058,430 | 11/15/1977 | Suntola, T., et al. | 427 | 255.13 | 11/25/1975 |
| | US-5,302,461 | 04/12/1994 | Anthony, T. C. | 428 | 472 | 06/05/1992 |
| | US-5,625,233 | 04/29/1997 | Cabral, Jr., C., et al. | 257 | 771 | 01/13/1995 |
| | US-5,789,030 | 08/04/1998 | Rolfson, J B. | 429 | 309 | 03/18/1996 |
| | US-6,010,969 | 01/04/2000 | Vaarstra, Brian A. | 438 | 758 | 10/02/1996 |
| | US-6,025,627 | 02/15/2000 | Forbes, Leonard, et al. | 257 | 321 | 05/29/1998 |
| | US-6,040,243 | 03/21/2000 | Li, J., et al. | 438 | 687 | 09/20/1999 |
| | US-6,120,531 | 09/19/2000 | Zhou, Lin, et al. | 607 | 111 | 10/17/1997 |
| | US-6,187,484 | 02/13/2001 | Glass, Thomas R., et al. | 430 | 5 | 08/31/1999 |
| | US-6,203,726 | 03/20/2001 | Danielson, Earl, et al. | 252 | 301 | 10/07/1999 |
| | US-6,217,645 | 04/17/2001 | Vaartstra, Brian A. | 106 | 287.18 | 09/02/1999 |
| | US-6,225,237 | 05/01/2001 | Vaartstra, Brian A. | 438 | 778 | 09/01/1998 |
| | US-6,273,951 | 08/14/2001 | Vaartstra, Brian A. | 117 | 104 | 06/16/1999 |

EXAMINER

DATE CONSIDERED

3/2/05

PTC/SB/884(10-01)
Approved for use through 10/31/2002, OMB 651-0031
US Patent & Trademark Office: U.S. DEPARTMENT OF COMMERCE

| | Under the Paperwork Reduction Act of 1995, no persons are | required to respond to a collection of information unless it contains a valid OMB control number. |
|--|---|---|
| Substitute for form 1449A/PTO INFORMATION DISCLOSURE | Complete if Known | |
| STATEMENT BY APPLICANT | Application Number | 09/945,535 |
| (Use as many sheets as necessary) | Filing Date | August 30, 2001 |
| Ya | First Named Inventor | Ahn, Kie |
| COPY | Group Art Unit | 2813 |
| | Examiner Name | Blum, David |
| Sheet 2 of 4 | Attorney Docket No: 1 | 303.026US1 |

Sheet 2 of 4

| 62 | US-6,294,813 | 09/25/2001 | Forbes, Leonard, et al. | 257 | 321 | 02/15/2000 |
|----------|--------------|------------|-------------------------------|-----|-------|------------|
| \neg | US-6,300,203 | 10/09/2001 | Buynoski, M. S., et al. | 438 | 287 | 10/05/2000 |
| 1 | US-6,331,465 | 12/18/2001 | Forbes, Leonard, et al. | 438 | 260 | 02/15/2000 |
| 7 | US-6,368,398 | 04/09/2002 | Vaartstra, Brian A. | 106 | 28718 | 01/19/2001 |
| | US-6,368,518 | 04/09/2002 | Vaartstra, Brian A. | 216 | 67 | 08/25/1999 |
| | US-6,451,641 | 09/17/2002 | Halliyal, Arvind, et al. | 438 | 200 | 02/27/2002 |
| | US-6,451,662 | 09/17/2002 | Chudzik, M., et al. | 438 | 386 | 10/04/2001 |
| | US-6,455,717 | 09/24/2002 | Vaartstra, Brian A. | 556 | 1 | 08/28/2000 |
| 7 | US-6,461,914 | 10/08/2002 | Roberts, D. R., et al. | 438 | 253 | 08/29/2001 |
| | US-6,498,063 | 12/24/2002 | Ping, Er-Xuan | 438 | 253 | 10/12/2001 |
| | US-6,518,610 | 02/11/2003 | Yang, Haining , et al. | 257 | 295 | 02/20/2001 |
| | US-6,524,867 | 02/25/2003 | Yang, Haining , et al. | 438 | 3 | 12/28/2000 |
| | US-6,524,901 | 02/25/2003 | Trivedi, Jigish D. | 438 | 183 | 06/20/2002 |
| | US-6,527,866 | 03/04/2003 | Matijasevic, Vladimir, et al. | 118 | 719 | 02/09/2000 |
| | US-6,531,354 | 03/11/2003 | Maria, J., et al. | 438 | 216 | 01/17/2001 |
| | US-6,537,613 | 03/25/2003 | Senzaki, Y., et al. | 427 | 250 | 04/10/2000 |
| | US-6,544,875 | 04/08/2003 | Wilk, Glen D. | 438 | 591 | 01/07/2000 |
| | US-6,573,199 | 06/03/2003 | Sandhu, Gurtej S., et al. | 438 | 798 | 08/30/2001 |
| | US-6,586,792 | 07/01/2003 | Ahn, Kie Y., et al. | 257 | 295 | 03/15/2001 |
| | US-6,593,610 | 07/15/2003 | Gonzalez, Fernando | 257 | 296 | 12/13/2001 |
| | US-6,608,378 | 08/19/2003 | Ahn, Kie Y., et al. | 257 | 701 | 08/26/2002 |
| | US-6,613,702 | 09/02/2003 | Sandhu, Gurtej S., et al. | 438 | 798 | 01/17/2003 |
| | US-6,620,670 | 09/16/2003 | Song, K., et al. | 438 | 216 | 01/18/2002 |
| | US-6,627,503 | 09/30/2003 | Ma, Y., et al. | 438 | 287 | 04/30/2002 |
| | US-6,639,267 | 10/28/2003 | Eldridge, Jerome M. | 257 | 310 | 07/29/2002 |
| | US-6,645,882 | 11/11/2003 | Halliyal, Arvind , et al. | 438 | 785 | 01/17/2002 |
| | US-6,660,660 | 12/09/2003 | Haukka, S. P., et al. | 438 | 778 | 08/31/2001 |
| <u> </u> | US-6,661,058 | 12/09/2003 | Ahn, Kie Y., et al. | 257 | 344 | 02/11/2002 |
| | US-6,682,602 | 01/27/2004 | Vaartstra, Brian A. | 118 | 715 | 08/19/2002 |
| | US-6,683,005 | 01/27/2004 | Sandhu, Gurtej S., et al. | 438 | 715 | 01/17/2003 |
| | US-6,683,011 | 01/27/2002 | Smith, Ryan et al. | 438 | 785 | 11/14/2001 |
| | US-6,696,332 | 02/24/2004 | Visokay, M. R., et al. | 438 | 216 | 06/21/2002 |
| | US-6,699,745 | 03/02/2004 | Banerjee, Aditi et al. | 438 | 238 | 03/27/1998 |
| | US-6,713,846 | 03/30/2004 | Senzaki, Y. | 257 | 635 | 01/25/2002 |
| | US-6,730,575 | 05/04/2004 | Eldridge, Jerome M. | 257 | 310 | 08/30/2001 |
| 1/ | US-6,750,066 | 06/15/2004 | Cheung, F. T., et al. | 438 | 3 | 04/08/2002 |
| ~ | US-6,762,114 | 07/13/2004 | Chambers, J. J. | 438 | 591 | 12/31/2002 |
| | | | | | | |

3/1/05 **EXAMINER DATE CONSIDERED**

PTC/SB/08A(10-01)
Approved for use through 10/31/2002. OMB 651-0031
US Patent & Traismant Office: US. DEPARTMENT OF COMMERCE

| Substitute for form 1449A/PTO | Under the Paperwork Reduction Act of 1995, no persons are | required to respond to a collection of information unless it contains a valid CMIB control number | | | |
|-----------------------------------|---|---|--|--|--|
| INFORMATION DISCLOSURE | Complete if Known | Complete if Known | | | |
| STATEMENT BY APPLICANT | Application Number | 09/945,535 | | | |
| (Use as many sheets as necessary) | Filing Date | August 30, 2001 | | | |
| | First Named Inventor | Ahn, Kie | | | |
| -OPT | Group Art Unit | 2813 | | | |
| COPY | Examiner Name | Blum, David | | | |
| Sheet 3 of 4 | Attorney Docket No: 1 | 303.026US1 | | | |

| Cite Initials* No* Include name of the author (in CAPITA LETTERS), title of the article (when appendiste, title of the article (when appendiste, title) are (took, magatine, journal, serial, sympostum, catalog, etc.), date, page(s), volume-tasue number(s), published, | | | R DOCUMENTS NON PATENT LITERATURE DOCUMENTS | |
|--|----------|---|---|--|
| "Improved Metallurgy for Wiring Very Large Scale Integrated Circuits", International Technology Disclosures, 4, Abstract, (1986), 1 page BRAUD, F., "Ultra Thin Diffusion Barriers for Cu Interconnections at The Gigabit Generation and Beyond", VMIC Conference Proceedings, (1996), 174-179 CALLEGARI, A., et al., "Physical and electrical characterization of Hafnium oxide and Hafnium silicate sputtered films", Journal of Applied Physics, 90(12), (December 15, 2001), 6466-75 CHANG, HYO S., et al., "Excellent thermal stability of Al2O3/ZrO2/Al2O3 stack structure of metal-oxide-semiconductor gate dielectrics application", Applied Physics Letters, 80(18), (May 6, 2002), 3385-7 CHEN, P. J., et al., "Thermal stability ans scalability of Zr-aluminate-based high-k gate stacks", Symposium on VLSI Technology Digest, (2002), 192-3 CLARK, P., "IMEC Highlights Hafnium, Metal Gates for High-k Integration", Semiconductor Business News, at Silicon Strategies.com,(10/11/02), 2 pages COLOMBO, D., et al., "Anhydrous Metal Nitrates as Volatile Single Source Precursors for the CVD of Metal Oxide Films", Communications, Department of EE, U of M. Mpls, MN, (77/98), 3 pages CONLEY JR., J F., et al., "Anhoric Layer Depostion of Hafnium Oxide Using Anhydrous Hafnium Nitrate", Electrochemical and Solid State Letters, 5(5), (2002), C57-C59 DA ROSA, E B., et al., "Annealing of ZrAl/sub x/O/sub y/ ultrathin films on Si in a vacuum or in O/sub 2", Journal of the Electrochemical Society, 148 (12), (December 2001), G695-G703 DING, "Copper Barrier, Seed Layer and Planerization Technologies", VMIC Conference Proceedings, (1997),87-92 FUKUMOTO, HIROFUMI, et al., "Fleteronic Properties of the Interface between Si and TiO2 Deposited at Very Low Temperatures", Japanese Journal of Applied Physics, 25(9), (September 1986), 1288-1291 GUO, XIN, et al., "High quality ultra-thin (1.5 nm) TiO2-Si3N 4 gate dielectric for deep sub-micron CMOS technology", IEDM Technical Digest. International Electron Devices Meeting, Ctied in related application, (Decem | | | (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published. | 1" |
| "Improved Metallurgy for Wiring Very Large Scale Integrated Circuits", International Technology Disclosures, 4, Abstract, (1986), 1 page BRAUD, F., "Ultra Thin Diffusion Barriers for Cu Interconnections at The Gigabit Generation and Beyond", VMIC Conference Proceedings, (1996), 174-179 CALLEGARI, A., et al., "Physical and electrical characterization of Hafnium oxide and Hafnium silicate sputtered films", Journal of Applied Physics, 90(12), (December 15, 2001),6466-75 CHANG, HYO S., et al., "Excellent thermal stability of Al2O3/ZrO2/Al2O3 stack structure of metal-oxide-semiconductor gate dielectrics application", Applied Physics Letters, 80(18), (May 6, 2002),3385-7 CHEN, P. J., et al., "Thermal stability ans scalability of Zr-aluminate-based high-k gate stacks", Symposium on VLSI Technology Digest, (2002),192-3 CLARK, P., "IMEC Highlights Hafnium, Metal Gates for High-k Integration", Semiconductor Business News, at Silicon Strategies.com,(10/11/02),2 pages COLOMBO, D., et al., "Anhydrous Metal Nitrates as Volatile Single Source Precursors for the CVD of Metal Oxide Films", Communications, Department of EE, U of M, Mpls, MN, (7/7/98),3 pages CONLEY JR., J F., et al., "Atomic Layer Deposition of Hafnium Oxide Using Anhydrous Hafnium Nitrate", Electrochemical and Solid State Letters, 5(5), (2002),C57-C59 DA ROSA, E B., et al., "Annealing of ZrAl/sub x/O/sub y/ ultrathin films on Si in a vacuum or in O/sub 2", Journal of the Electrochemical Society, 148 (12), (December 2001),G695-G703 DING, "Copper Barrier, Seed Layer and Planerization Technologies", VMIC Conference Proceedings, (1997),87-92 FUKUMOTO, HIROFUMI, et al., "Heteroepitaxial growth of Y2O3 films on silicon", Applied Physics, Letters, 55(4), (July 24, 1989),360-361 FUYUKI, TAKASHI, et al., "Electronic Properties of the Interface between Si and TiO2 Deposited at Very Low Temperatures", Japanese Journal of Applied Physics, 25(9), (September 1986),1288-1291 GUO, XIN, et al., "High quality ultra-thin (1.5 nm) TiO2-Si3N 4 gate dielectric for deep su | DSD | | | |
| International Technology Disclosures, 4, Abstract, (1986), 1 page BRAUD, F., "Ultra Thin Diffusion Barriers for Cu Interconnections at The Gigabit Generation and Beyond", YMIC Conference Proceedings, (1996),174-179 CALLEGARI, A., et al., "Physical and electrical characterization of Hafnium oxide and Hafnium silicate sputtered films", Journal of Applied Physics, 90(12), (December 15, 2001),6466-75 CHANG, HYO S., et al., "Excellent thermal stability of Al2O3/ZrO2/Al2O3 stack structure of metal-oxide-semiconductor gate dielectrics application", Applied Physics Letters, 80(18), (May 6, 2002),3385-7 CHEN, P. J., et al., "Thermal stability ans scalability of Zr-aluminate-based high-k gate stacks", Symposium on VLSI Technology Digest, (2002),192-3 CLARK, P., "IMEC Highlights Hafnium, Metal Gates for High-k Integration", Semiconductor Business News, at Silicon Strategies.com, (10/11/02),2 pages COLOMBO, D., et al., "Anhydrous Metal Nitrates as Volatile Single Source Precursors for the CVD of Metal Oxide Films", Communications, Department of EE, U of M. Mpls, MN, (7/7/98),3 pages CONLEY JR., J F., et al., "Atomic Layer Depostion of Hafnium Oxide Using Anhydrous Hafnium Nitrate", Electrochemical and Solid State Letters, 5(5), (2002), C57-C59 DA ROSA, E B, et al., "Annealing of ZrAl/sub x/O/sub y/ ultrathin films on Si in a vacuum or in O/sub 2", Journal of the Electrochemical Society, 148 (12), (December 2001), G695-G703 DING, "Copper Barrier, Seed Layer and Planerization Technologies", VMIC Conference Proceedings, (1997),87-92 FUKUMOTO, HIROFUMI, et al., "Heteroepitaxial growth of Y2O3 films on silicon", Applied Physics Letters, 55(4), (July 24, 1989),360-361 FUYUKI, TAKASHI, et al., "Electronic Properties of the Interface between Si and TiO2 Deposited at Very Low Temperatures", Japanese Journal of Applied Physics, 25(9), (September 1986),1288-1291 GUO, XIN, et al., "High quality ultra-thin (1.5 nm) TiO2-SI3N 4 gate dielectric for deep sub-micron CMOS technology", IEDM Technical Digest. International Electro | ילעש | | | <u> </u> |
| BRAUD, F., "Ultra Thin Diffusion Barriers for Cu Interconnections at The Gigabit Generation and Beyond", VMIC Conference Proceedings, (1996),174-179 CALLEGARI, A., et al., "Physical and electrical characterization of Hafnium oxide and Hafnium silicate sputtered films", Journal of Applied Physics, 90(12), (December 15, 2001),6466-75 CHANG, HYO S., et al., "Excellent thermal stability of Al2O3/ZrO2/Al2O3 stack structure of metal-oxide-semiconductor gate dielectrics application", Applied Physics Letters, 80(18), (May 6, 2002),3385-7 CHEN, P. J., et al., "Thermal stability ans scalability of Zr-aluminate-based high-k gate stacks", Symposium on VLSI Technology Digest, (2002),192-3 CLARK, P., "IMEC Highlights Hafnium, Metal Gates for High-k Integration", Semiconductor Business News, at Silicon Strategies.com, (101/10/2),2 pages COLOMBO, D., et al., "Anhydrous Metal Nitrates as Volatile Single Source Precursors for the CVD of Metal Oxide Films", Communications, Department of EE, U of M, Mpls, MN, (7/7/98),3 pages CONLEY JR., J. F., et al., "Atomic Layer Deposition of Hafnium Oxide Using Anhydrous Hafnium Nitrate", Electrochemical and Solid State Letters, 5(5), (2002), C57-C59 DA ROSA, E. B., et al., "Annealing of ZrAl/sub x/O/sub y/ ultrathin films on Si in a vacuum or in O/sub 2/", Journal of the Electrochemical Society, 148 (12), (December 2001), G695-G703 DING, "Copper Barrier, Seed Layer and Planerization Technologies", VMIC Conference Proceedings, (1997),87-92 FUKUMOTO, HIROFUMI, et al., "Heteroepitaxial growth of Y2O3 films on silicon", Applied Physics, Letters, 55(4), (July 24, 1989),360-361 FUYUKI, TAKASHI, et al., "Electrochier Properties of the Interface between Si and TiO2 Deposited at Very Low Temperatures", Japanese Journal of Applied Physics, 25(9), (September 1986),1288-1291 GUO, XIN, et al., "High quality ultra-thin (1.5 nm) TiO2-Si3N 4 gate dielectric for deep sub-micron CMOS technology", IEDM Technical Digest. International Electron Devices Meeting, Ctied in related application, (December | | | | |
| Gigabit Generation and Beyond", VMIC Conference Proceedings, (1996),174-179 CALLEGARI, A., et al., "Physical and electrical characterization of Hafnium oxide and Hafnium silicate sputtered films", Journal of Applied Physics, 90(12), (December 15, 2001),6466-75 CHANG, HYO S., et al., "Excellent thermal stability of Al2O3/ZrO2/Al2O3 stack structure of metal-oxide-semiconductor gate dielectrics application", Applied Physics Letters, 80(18), (May 6, 2002),3385-7 CHEN, P. J., et al., "Thermal stability ans scalability of Zr-aluminate-based high-k gate stacks", Symposium on VLSI Technology Digest, (2002),192-3 CLARK, P. "IMEC Highlights Hafnium, Metal Gates for High-k Integration", Semiconductor Business News, at Silicon Strategies.com, (10/11/02),2 pages COLOMBO, D., et al., "Anhydrous Metal Nitrates as Volatitle Single Source Precursors for the CVD of Metal Oxide Films", Communications, Department of EE, U of M, Mpls, MN, (7/7/98),3 pages CONLEY JR., J F., et al., "Atomic Layer Deposition of Hafnium Oxide Using Anhydrous Hafnium Nitrate", Electrochemical and Solid State Letters, 5(5), (2002),C57-C59 DA ROSA, E B., et al., "Annealing of ZrAl/sub x/O/sub y/ ultrathin films on Si in a vacuum or in O/sub 2/", Journal of the Electrochemical Society, 148 (12), (December 2001),G695-G703 DING, "Copper Barrier, Seed Layer and Planerization Technologies", VMIC Conference Proceedings, (1997),87-92 FUKUMOTO, HIROFUMI, et al., "Heteroepitaxial growth of Y2O3 films on silicon", Applied Physics, Letters, 55(4), (July 24, 1989),360-361 FUYUKI, TAKASHI, et al., "Electronic Properties of the Interface between Si and TiO2 Deposited at Very Low Temperatures", Japanese Journal of Applied Physics, 25(9), (September 1986),1288-1291 GUO, XIN, et al., "High quality ultra-thin (1.5 mm) TiO2-Si3N 4 gate dielectric for deep sub-micron CMOS technology", IEDM Technical Digest. International Electron Devices Meeting, Ctied in related application, (December 5-8, 1999),137-140 | | | International Technology Disclosures, 4, Abstract,(1986),1 page | |
| CALLEGARI, A., et al., "Physical and electrical characterization of Hafnium oxide and Hafnium silicate sputtered films", Journal of Applied Physics, 90(12), (December 15, 2001),6466-75 CHANG, HYO S., et al., "Excellent thermal stability of Al2O3/ZrO2/Al2O3 stack structure of metal-oxide-semiconductor gate dielectrics application", Applied Physics Letters, 80(18), (May 6, 2002),3385-7 CHEN, P. J., et al., "Thermal stability ans scalability of Zr-aluminate-based high-k gate stacks", Symposium on VLSI Technology Digest, (2002),192-3 CLARK, P., "IMEC Highlights Hafnium, Metal Gates for High-k Integration", Semiconductor Business News, at Silicon Strategies.com,(10/11/02),2 pages COLOMBO, D., et al., "Anhydrous Metal Nitrates as Volatile Single Source Precursors for the CVD of Metal Oxide Films", Communications, Department of EE, U of M, Mpls, MN, (777/98),3 pages CONLEY JR., J F., et al., "Atomic Layer Deposition of Hafnium Oxide Using Anhydrous Hafnium Nitrate", Electrochemical and Solid State Letters, 5(5), (2002),C57-C59 DA ROSA, E B., et al., "Annealing of ZrAl/sub x/O/sub y/ ultrathin films on Si in a vacuum or in O/sub 2", Journal of the Electrochemical Society, 148 (12), (December 2001),G695-G703 DING, "Copper Barrier, Seed Layer and Planerization Technologies", VMIC Conference Proceedings, (1997),87-92 FUKUMOTO, HIROFUMI, et al., "Heteroepitaxial growth of Y2O3 films on silicon", Applied Physics Letters, 55(4), (July 24, 1989),360-Y2O3 films on silicon", Applied Physics Letters, 55(4), International FUYUKI, TAKASHI, et al., "Electronic Properties of the Interface between Si and TiO2 Deposited at Very Low Temperatures", Japanese Journal of Applied Physics, 25(9), (September 1986),1288-1291 GUO, XIN, et al., "High quality ultra-thin (1.5 nm) TiO2-Si3N 4 gate dielectric for deep sub-micron CMOS technology", IEDM Technical Digest. International Electron Devices Meeting, Ctied in related application, (December 5-8, 1999),137-140 | 1 | | BRAUD, F., "Ultra Thin Diffusion Barriers for Cu Interconnections at The | |
| oxide and Hafnium silicate sputtered films", <u>Journal of Applied Physics</u> , 90(12), (December 15, 2001),6466-75 CHANG, HYO S., et al., "Excellent thermal stability of Al2O3/ZrO2/Al2O3 stack structure of metal-oxide-semiconductor gate dielectrics application", <u>Applied Physics Letters</u> , 80(18), (May 6, 2002),3385-7 CHEN, P. J., et al., "Thermal stability ans scalability of Zr-aluminate-based high-k gate stacks", <u>Symposium on VLSI Technology Digest</u> , (2002),192-3 CLARK, P., "IMEC Highlights Hafnium, Metal Gates for High-k Integration", <u>Semiconductor Business News</u> , at Silicon Strategies.com,(10/11/02),2 pages COLOMBO, D., et al., "Anhydrous Metal Nitrates as Volatile Single Source Precursors for the CVD of Metal Oxide Films", <u>Communications</u> , <u>Department of EE</u> , U of M. Mpls, MN, (7/7/98),3 pages CONLEY JR., J. F., et al., "Atomic Layer Depostion of Hafnium Oxide Using Anhydrous Hafnium Nitrate", <u>Electrochemical and Solid State Letters</u> , 5(5), (2002),C57-C59 DA ROSA, E. B., et al., "Annealing of ZrAl/sub x/O/sub y/ ultrathin films on Si in a vacuum or in O/sub 2/", <u>Journal of the Electrochemical Society</u> , 148 (12), (December 2001),G695-G703 DING, "Copper Barrier, Seed Layer and Planerization Technologies", <u>VMIC Conference Proceedings</u> , (1997),87-92 FUKUMOTO, HIROFUMI, et al., "Heteroepitaxial growth of Y2O3 films on silicon", <u>Applied Physics Letters</u> , 55(4), (July 24, 1989),360-361 FUYUKI, TAKASHI, et al., "Electronic Properties of the Interface between Si and TiO2 Deposited at Very Low Temperatures", <u>Japanese Journal of Applied Physics</u> , 25(9), (September 1986),1288-1291 GUO, XIN, et al., "High quality ultra-thin (1.5 nm) TiO2-Si3N 4 gate dielectric for deep sub-micron CMOS technology", <u>IEDM Technical Digest. International Electron Devices Meeting</u> , Ctied in related application, (December 5-8, 1999),137-140 | | | 179 | |
| oxide and Hafnium silicate sputtered films", <u>Journal of Applied Physics</u> , 90(12), (December 15, 2001),6466-75 CHANG, HYO S., et al., "Excellent thermal stability of Al2O3/ZrO2/Al2O3 stack structure of metal-oxide-semiconductor gate dielectrics application", <u>Applied Physics Letters</u> , 80(18), (May 6, 2002),3385-7 CHEN, P. J., et al., "Thermal stability ans scalability of Zr-aluminate-based high-k gate stacks", <u>Symposium on VLSI Technology Digest</u> , (2002),192-3 CLARK, P., "IMEC Highlights Hafnium, Metal Gates for High-k Integration", <u>Semiconductor Business News</u> , at Silicon Strategies.com,(10/11/02),2 pages COLOMBO, D., et al., "Anhydrous Metal Nitrates as Volatile Single Source Precursors for the CVD of Metal Oxide Films", <u>Communications</u> , <u>Department of EE</u> , U of M. Mpls, MN, (7/7/98),3 pages CONLEY JR., J. F., et al., "Atomic Layer Depostion of Hafnium Oxide Using Anhydrous Hafnium Nitrate", <u>Electrochemical and Solid State Letters</u> , 5(5), (2002),C57-C59 DA ROSA, E. B., et al., "Annealing of ZrAl/sub x/O/sub y/ ultrathin films on Si in a vacuum or in O/sub 2/", <u>Journal of the Electrochemical Society</u> , 148 (12), (December 2001),G695-G703 DING, "Copper Barrier, Seed Layer and Planerization Technologies", <u>VMIC Conference Proceedings</u> , (1997),87-92 FUKUMOTO, HIROFUMI, et al., "Heteroepitaxial growth of Y2O3 films on silicon", <u>Applied Physics Letters</u> , 55(4), (July 24, 1989),360-361 FUYUKI, TAKASHI, et al., "Electronic Properties of the Interface between Si and TiO2 Deposited at Very Low Temperatures", <u>Japanese Journal of Applied Physics</u> , 25(9), (September 1986),1288-1291 GUO, XIN, et al., "High quality ultra-thin (1.5 nm) TiO2-Si3N 4 gate dielectric for deep sub-micron CMOS technology", <u>IEDM Technical Digest. International Electron Devices Meeting</u> , Ctied in related application, (December 5-8, 1999),137-140 | | | CALLEGARI, A., et al., "Physical and electrical characterization of Hafnium | |
| (December 15, 2001),6466-75 CHANG, HYO S., et al., "Excellent thermal stability of Al2O3/ZrO2/Al2O3 stack structure of metal-oxide-semiconductor gate dielectrics application", Applied Physics Letters, 80(18), (May 6, 2002),3385-7 CHEN, P. J., et al., "Thermal stability ans scalability of Zr-aluminate-based high-k gate stacks", Symposium on VLSI Technology Digest, (2002),192-3 CLARK, P, "IMEC Highlights Hafnium, Metal Gates for High-k Integration", Semiconductor Business News, at Silicon Strategies.com,(10/11/02),2 pages COLOMBO, D., et al., "Anhydrous Metal Nitrates as Volatile Single Source Precursors for the CVD of Metal Oxide Films", Communications, Department of EE, U of M, Mpls, MN, (7/7/98),3 pages CONLEY JR., J F., et al., "Atomic Layer Deposition of Hafnium Oxide Using Anhydrous Hafnium Nitrate", Electrochemical and Solid State Letters, 5(5), (2002),C57-C59 DA ROSA, E B., et al., "Annealing of ZrAl/sub x/O/sub y/ ultrathin films on Si in a vacuum or in O/sub 2/", Journal of the Electrochemical Society, 148 (12), (December 2001),G695-G703 DING, "Copper Barrier, Seed Layer and Planerization Technologies", VMIC Conference Proceedings, (1997),87-92 FUKUMOTO, HIROFUMI, et al., "Heteroepitaxial growth of Y2O3 films on silicon", Applied Physics Letters, 55(4), (July 24, 1989),360-361 FUYUKI, TAKASHI, et al., "Electronic Properties of the Interface between Si and TiO2 Deposited at Very Low Temperatures", Japanese Journal of Applied Physics, 25(9), (September 1986),1288-1291 GUO, XIN, et al., "High quality ultra-thin (1.5 nm) TiO2-Si3N 4 gate dielectric for deep sub-micron CMOS technology", IEDM Technical Digest. International Electron Devices Meeting, Ctied in related application, (December 5-8, 1999), 137-140 IIJIMA, T., "Microstructure and Electrical Properties of Amorphous W-Si-N | | | oxide and Hafnium silicate sputtered films", Journal of Applied Physics, 90(12), | 1 |
| structure of metal-oxide-semiconductor gate dielectrics application", Applied Physics Letters, 80(18), (May 6, 2002),3385-7 CHEN, P. J., et al., "Thermal stability ans scalability of Zr-aluminate-based high-k gate stacks", Symposium on VLSI Technology Digest, (2002),192-3 CLARK, P., "IMEC Highlights Hafnium, Metal Gates for High-k Integration", Semiconductor Business News, at Silicon Strategies.com,(10/11/02),2 pages COLOMBO, D., et al., "Anhydrous Metal Nitrates as Volatile Single Source Precursors for the CVD of Metal Oxide Films", Communications, Department of EE, U of M, Mpls, MN, (7/7/98),3 pages CONLEY JR., J F., et al., "Atomic Layer Depostion of Hafnium Oxide Using Anhydrous Hafnium Nitrate", Electrochemical and Solid State Letters, 5(5), (2002),C57-C59 DA ROSA, E B., et al., "Annealing of ZrAl/sub x/O/sub y/ ultrathin films on Si in a vacuum or in O/sub 2/", Journal of the Electrochemical Society, 148 (12), (December 2001),G695-G703 DING, "Copper Barrier, Seed Layer and Planerization Technologies", VMIC Conference Proceedings, (1997),87-92 FUKUMOTO, HIROFUMI, et al., "Heteroepitaxial growth of Y2O3 films on silicon", Applied Physics Letters, 55(4), (July 24, 1989),360-361 FUYUKI, TAKASHI, et al., "Electronic Properties of the Interface between Si and TiO2 Deposited at Very Low Temperatures", Japanese Journal of Applied Physics, 25(9), (September 1986),1288-1291 GUO, XIN, et al., "High quality ultra-thin (1.5 nm) TiO2-Si3N 4 gate dielectric for deep sub-micron CMOS technology", IEDM Technical Digest. International Electron Devices Meeting, Ctied in related application, (December 5-8, 1999), 137-140 | | | (December 15, 2001),6466-75 | |
| Physics Letters, 80(18), (May 6, 2002),3385-7 CHEN, P. J., et al., "Thermal stability ans scalability of Zr-aluminate-based high-k gate stacks", Symposium on VLSI Technology Digest, (2002),192-3 CLARK, P., "IMEC Highlights Hafnium, Metal Gates for High-k Integration", Semiconductor Business News, at Silicon Strategies.com,(10/11/02),2 pages COLOMBO, D., et al., "Anhydrous Metal Nitrates as Volatile Single Source Precursors for the CVD of Metal Oxide Films", Communications, Department of EE, U of M, Mpls, MN, (7/7/98),3 pages CONLEY JR., J F., et al., "Atomic Layer Deposition of Hafnium Oxide Using Anhydrous Hafnium Nitrate", Electrochemical and Solid State Letters, 5(5), (2002),C57-C59 DA ROSA, E B., et al., "Annealing of ZrAl/sub x/O/sub y/ ultrathin films on Si in a vacuum or in O/sub 2/", Journal of the Electrochemical Society, 148 (12), (December 2001),G695-G703 DING, "Copper Barrier, Seed Layer and Planerization Technologies", VMIC Conference Proceedings, (1997),87-92 FUKUMOTO, HIROFUMI, et al., "Heteroepitaxial growth of Y2O3 films on silicon", Applied Physics Letters, 55(4), (July 24, 1989),360-361 FUYUKI, TAKASHI, et al., "Electronic Properties of the Interface between Si and TiO2 Deposited at Very Low Temperatures", Japanese Journal of Applied Physics, 25(9), (September 1986),1288-1291 GUO, XIN, et al., "High quality ultra-thin (1.5 nm) TiO2-Si3N 4 gate dielectric for deep sub-micron CMOS technology", IEDM Technical Digest. International Electron Devices Meeting, Ctied in related application, (December 5-8, 1999), 137-140 IIJIMA, T., "Microstructure and Electrical Properties of Amorphous W-Si-N | | | CHANG, HYO S., et al., "Excellent thermal stability of Al2O3/ZrO2/Al2O3 stack | |
| Physics Letters, 80(18), (May 6, 2002),3385-7 CHEN, P. J., et al., "Thermal stability ans scalability of Zr-aluminate-based high-k gate stacks", Symposium on VLSI Technology Digest, (2002),192-3 CLARK, P., "IMEC Highlights Hafnium, Metal Gates for High-k Integration", Semiconductor Business News, at Silicon Strategies.com,(10/11/02),2 pages COLOMBO, D., et al., "Anhydrous Metal Nitrates as Volatile Single Source Precursors for the CVD of Metal Oxide Films", Communications, Department of EE, U of M, Mpls, MN, (7/7/98),3 pages CONLEY JR., J F., et al., "Atomic Layer Deposition of Hafnium Oxide Using Anhydrous Hafnium Nitrate", Electrochemical and Solid State Letters, 5(5), (2002),C57-C59 DA ROSA, E B., et al., "Annealing of ZrAl/sub x/O/sub y/ ultrathin films on Si in a vacuum or in O/sub 2/", Journal of the Electrochemical Society, 148 (12), (December 2001),G695-G703 DING, "Copper Barrier, Seed Layer and Planerization Technologies", VMIC Conference Proceedings, (1997),87-92 FUKUMOTO, HIROFUMI, et al., "Heteroepitaxial growth of Y2O3 films on silicon", Applied Physics Letters, 55(4), (July 24, 1989),360-361 FUYUKI, TAKASHI, et al., "Electronic Properties of the Interface between Si and TiO2 Deposited at Very Low Temperatures", Japanese Journal of Applied Physics, 25(9), (September 1986),1288-1291 GUO, XIN, et al., "High quality ultra-thin (1.5 nm) TiO2-Si3N 4 gate dielectric for deep sub-micron CMOS technology", IEDM Technical Digest. International Electron Devices Meeting, Ctied in related application, (December 5-8, 1999), 137-140 IIJIMA, T., "Microstructure and Electrical Properties of Amorphous W-Si-N | 1 1 | | | 1 |
| k gate stacks", Symposium on VLSI Technology Digest, (2002),192-3 CLARK, P., "IMEC Highlights Hafnium, Metal Gates for High-k Integration", Semiconductor Business News, at Silicon Strategies.com,(10/11/02),2 pages COLOMBO, D., et al., "Anhydrous Metal Nitrates as Volatile Single Source Precursors for the CVD of Metal Oxide Films", Communications, Department of EE, U of M, Mpls, MN, (7/7/98),3 pages CONLEY JR., J F., et al., "Atomic Layer Deposition of Hafnium Oxide Using Anhydrous Hafnium Nitrate", Electrochemical and Solid State Letters, 5(5), (2002),C57-C59 DA ROSA, E B., et al., "Annealing of ZrAl/sub x/O/sub y/ ultrathin films on Si in a vacuum or in O/sub 2/", Journal of the Electrochemical Society, 148 (12), (December 2001),G695-G703 DING, "Copper Barrier, Seed Layer and Planerization Technologies", VMIC Conference Proceedings, (1997),87-92 FUKUMOTO, HIROFUMI, et al., "Heteroepitaxial growth of Y2O3 films on silicon", Applied Physics Letters, 55(4), (July 24, 1989),360-361 FUYUKI, TAKASHI, et al., "Electronic Properties of the Interface between Si and TiO2 Deposited at Very Low Temperatures", Japanese Journal of Applied Physics, 25(9), (September 1986),1288-1291 GUO, XIN, et al., "High quality ultra-thin (1.5 nm) TiO2-Si3N 4 gate dielectric for deep sub-micron CMOS technology", IEDM Technical Digest. International Electron Devices Meeting, Ctied in related application, (December 5-8, 1999), 137-140 IIJIMA, T., "Microstructure and Electrical Properties of Amorphous W-Si-N | 1 | | | ľ |
| CLARK, P, "IMEC Highlights Hafnium, Metal Gates for High-k Integration", Semiconductor Business News, at Silicon Strategies.com,(10/11/02),2 pages COLOMBO, D., et al., "Anhydrous Metal Nitrates as Volatile Single Source Precursors for the CVD of Metal Oxide Films", Communications, Department of EE, U of M, Mpls, MN, (7/7/98),3 pages CONLEY JR., J F., et al., "Atomic Layer Deposition of Hafnium Oxide Using Anhydrous Hafnium Nitrate", Electrochemical and Solid State Letters, 5(5), (2002),C57-C59 DA ROSA, E B., et al., "Annealing of ZrAl/sub x/O/sub y/ ultrathin films on Si in a vacuum or in O/sub 2/", Journal of the Electrochemical Society, 148 (12), (December 2001),G695-G703 DING, "Copper Barrier, Seed Layer and Planerization Technologies", VMIC Conference Proceedings, (1997),87-92 FUKUMOTO, HIROFUMI, et al., "Heteroepitaxial growth of Y2O3 films on silicon", Applied Physics Letters, 55(4), (July 24, 1989),360-361 FUYUKI, TAKASHI, et al., "Electronic Properties of the Interface between Si and TiO2 Deposited at Very Low Temperatures", Japanese Journal of Applied Physics, 25(9), (September 1986),1288-1291 GUO, XIN, et al., "High quality ultra-thin (1.5 nm) TiO2-Si3N 4 gate dielectric for deep sub-micron CMOS technology", IEDM Technical Digest. International Electron Devices Meeting, Ctied in related application, (December 5-8, 1999),137-140 | | | CHEN, P. J., et al., "Thermal stability ans scalability of Zr-aluminate-based high- | |
| CLARK, P, "IMEC Highlights Hafnium, Metal Gates for High-k Integration", Semiconductor Business News, at Silicon Strategies.com,(10/11/02),2 pages COLOMBO, D., et al., "Anhydrous Metal Nitrates as Volatile Single Source Precursors for the CVD of Metal Oxide Films", Communications, Department of EE, U of M, Mpls, MN, (7/7/98),3 pages CONLEY JR., J F., et al., "Atomic Layer Deposition of Hafnium Oxide Using Anhydrous Hafnium Nitrate", Electrochemical and Solid State Letters, 5(5), (2002),C57-C59 DA ROSA, E B., et al., "Annealing of ZrAl/sub x/O/sub y/ ultrathin films on Si in a vacuum or in O/sub 2/", Journal of the Electrochemical Society, 148 (12), (December 2001),G695-G703 DING, "Copper Barrier, Seed Layer and Planerization Technologies", VMIC Conference Proceedings, (1997),87-92 FUKUMOTO, HIROFUMI, et al., "Heteroepitaxial growth of Y2O3 films on silicon", Applied Physics Letters, 55(4), (July 24, 1989),360-361 FUYUKI, TAKASHI, et al., "Electronic Properties of the Interface between Si and TiO2 Deposited at Very Low Temperatures", Japanese Journal of Applied Physics, 25(9), (September 1986),1288-1291 GUO, XIN, et al., "High quality ultra-thin (1.5 nm) TiO2-Si3N 4 gate dielectric for deep sub-micron CMOS technology", IEDM Technical Digest. International Electron Devices Meeting, Ctied in related application, (December 5-8, 1999),137-140 | | | k gate stacks", Symposium on VLSI Technology Digest, (2002), 192-3 | ł |
| Semiconductor Business News, at Silicon Strategies.com,(10/11/02),2 pages COLOMBO, D., et al., "Anhydrous Metal Nitrates as Volatile Single Source Precursors for the CVD of Metal Oxide Films", Communications, Department of EE, U of M, Mpls, MN, (7/7/98),3 pages CONLEY JR., J F., et al., "Atomic Layer Deposition of Hafnium Oxide Using Anhydrous Hafnium Nitrate", Electrochemical and Solid State Letters, 5(5), (2002),C57-C59 DA ROSA, E B., et al., "Annealing of ZrAl/sub x/O/sub y/ ultrathin films on Si in a vacuum or in O/sub 2/", Journal of the Electrochemical Society, 148 (12), (December 2001),G695-G703 DING, "Copper Barrier, Seed Layer and Planerization Technologies", VMIC Conference Proceedings, (1997),87-92 FUKUMOTO, HIROFUMI, et al., "Heteroepitaxial growth of Y2O3 films on silicon", Applied Physics Letters, 55(4), (July 24, 1989),360-361 FUYUKI, TAKASHI, et al., "Electronic Properties of the Interface between Si and TiO2 Deposited at Very Low Temperatures", Japanese Journal of Applied Physics, 25(9), (September 1986),1288-1291 GUO, XIN, et al., "High quality ultra-thin (1.5 nm) TiO2-Si3N 4 gate dielectric for deep sub-micron CMOS technology", IEDM Technical Digest. International Electron Devices Meeting, Ctied in related application, (December 5-8, 1999),137-140 IIJIMA, T., "Microstructure and Electrical Properties of Amorphous W-Si-N | | | | 1 |
| COLOMBO, D., et al., "Anhydrous Metal Nitrates as Volatile Single Source Precursors for the CVD of Metal Oxide Films", Communications, Department of EE, U of M. Mpls, MN, (7/7/98),3 pages CONLEY JR., J F., et al., "Atomic Layer Depostion of Hafnium Oxide Using Anhydrous Hafnium Nitrate", Electrochemical and Solid State Letters, 5(5), (2002),C57-C59 DA ROSA, E B., et al., "Annealing of ZrAl/sub x/O/sub y/ ultrathin films on Si in a vacuum or in O/sub 2/", Journal of the Electrochemical Society, 148 (12), (December 2001),G695-G703 DING, "Copper Barrier, Seed Layer and Planerization Technologies", VMIC Conference Proceedings, (1997),87-92 FUKUMOTO, HIROFUMI, et al., "Heteroepitaxial growth of Y2O3 films on silicon", Applied Physics Letters, 55(4), (July 24, 1989),360-361 FUYUKI, TAKASHI, et al., "Electronic Properties of the Interface between Si and TiO2 Deposited at Very Low Temperatures", Japanese Journal of Applied Physics, 25(9), (September 1986),1288-1291 GUO, XIN, et al., "High quality ultra-thin (1.5 nm) TiO2-Si3N 4 gate dielectric for deep sub-micron CMOS technology", IEDM Technical Digest. International Electron Devices Meeting, Ctied in related application, (December 5-8, 1999), 137-140 IIJIMA, T., "Microstructure and Electrical Properties of Amorphous W-Si-N | | | Semiconductor Business News, at Silicon Strategies.com,(10/11/02),2 pages |] |
| Precursors for the CVD of Metal Oxide Films", Communications, Department of EE, U of M, Mpls, MN, (7/7/98),3 pages CONLEY JR., J F., et al., "Atomic Layer Deposition of Hafnium Oxide Using Anhydrous Hafnium Nitrate", Electrochemical and Solid State Letters, 5(5), (2002),C57-C59 DA ROSA, E B., et al., "Annealing of ZrAl/sub x/O/sub y/ ultrathin films on Si in a vacuum or in O/sub 2/", Journal of the Electrochemical Society, 148 (12), (December 2001),G695-G703 DING, "Copper Barrier, Seed Layer and Planerization Technologies", VMIC Conference Proceedings, (1997),87-92 FUKUMOTO, HIROFUMI, et al., "Heteroepitaxial growth of Y2O3 films on silicon", Applied Physics Letters, 55(4), (July 24, 1989),360-361 FUYUKI, TAKASHI, et al., "Electronic Properties of the Interface between Si and TiO2 Deposited at Very Low Temperatures", Japanese Journal of Applied Physics, 25(9), (September 1986),1288-1291 GUO, XIN, et al., "High quality ultra-thin (1.5 nm) TiO2-Si3N 4 gate dielectric for deep sub-micron CMOS technology", IEDM Technical Digest. International Electron Devices Meeting, Ctied in related application, (December 5-8, 1999), 137-140 IIJIMA, T., "Microstructure and Electrical Properties of Amorphous W-Si-N | | | COLOMBO, D., et al., "Anhydrous Metal Nitrates as Volatile Single Source | |
| EE, U of M, Mpls, MN, (7/7/98),3 pages CONLEY JR., J F., et al., "Atomic Layer Depostion of Hafnium Oxide Using Anhydrous Hafnium Nitrate", Electrochemical and Solid State Letters, 5(5), (2002),C57-C59 DA ROSA, E B., et al., "Annealing of ZrAl/sub x/O/sub y/ ultrathin films on Si in a vacuum or in O/sub 2/", Journal of the Electrochemical Society, 148 (12), (December 2001),G695-G703 DING, "Copper Barrier, Seed Layer and Planerization Technologies", VMIC Conference Proceedings, (1997),87-92 FUKUMOTO, HIROFUMI, et al., "Heteroepitaxial growth of Y2O3 films on silicon", Applied Physics Letters, 55(4), (July 24, 1989),360-361 FUYUKI, TAKASHI, et al., "Electronic Properties of the Interface between Si and TiO2 Deposited at Very Low Temperatures", Japanese Journal of Applied Physics, 25(9), (September 1986),1288-1291 GUO, XIN, et al., "High quality ultra-thin (1.5 nm) TiO2-Si3N 4 gate dielectric for deep sub-micron CMOS technology", IEDM Technical Digest. International Electron Devices Meeting, Ctied in related application, (December 5-8, 1999), 137-140 IIJIMA, T., "Microstructure and Electrical Properties of Amorphous W-Si-N | - { | | | |
| Anhydrous Hafnium Nitrate", Electrochemical and Solid State Letters, 5(5), (2002),C57-C59 DA ROSA, E B., et al., "Annealing of ZrAl/sub x/O/sub y/ ultrathin films on Si in a vacuum or in O/sub 2/", Journal of the Electrochemical Society, 148 (12), (December 2001),G695-G703 DING, "Copper Barrier, Seed Layer and Planerization Technologies", VMIC Conference Proceedings, (1997),87-92 FUKUMOTO, HIROFUMI, et al., "Heteroepitaxial growth of Y2O3 films on silicon", Applied Physics Letters, 55(4), (July 24, 1989),360-361 FUYUKI, TAKASHI, et al., "Electronic Properties of the Interface between Si and TiO2 Deposited at Very Low Temperatures", Japanese Journal of Applied Physics, 25(9), (September 1986),1288-1291 GUO, XIN, et al., "High quality ultra-thin (1.5 nm) TiO2-Si3N 4 gate dielectric for deep sub-micron CMOS technology", IEDM Technical Digest. International Electron Devices Meeting, Ctied in related application,(December 5-8, 1999),137-140 IIJIMA, T., "Microstructure and Electrical Properties of Amorphous W-Si-N | | | | 1 |
| Anhydrous Hafnium Nitrate", Electrochemical and Solid State Letters, 5(5), (2002),C57-C59 DA ROSA, E B., et al., "Annealing of ZrAl/sub x/O/sub y/ ultrathin films on Si in a vacuum or in O/sub 2/", Journal of the Electrochemical Society, 148 (12), (December 2001),G695-G703 DING, "Copper Barrier, Seed Layer and Planerization Technologies", VMIC Conference Proceedings, (1997),87-92 FUKUMOTO, HIROFUMI, et al., "Heteroepitaxial growth of Y2O3 films on silicon", Applied Physics Letters, 55(4), (July 24, 1989),360-361 FUYUKI, TAKASHI, et al., "Electronic Properties of the Interface between Si and TiO2 Deposited at Very Low Temperatures", Japanese Journal of Applied Physics, 25(9), (September 1986),1288-1291 GUO, XIN, et al., "High quality ultra-thin (1.5 nm) TiO2-Si3N 4 gate dielectric for deep sub-micron CMOS technology", IEDM Technical Digest. International Electron Devices Meeting, Ctied in related application,(December 5-8, 1999),137-140 IIJIMA, T., "Microstructure and Electrical Properties of Amorphous W-Si-N | | | | |
| (2002),C57-C59 DA ROSA, E B., et al., "Annealing of ZrAl/sub x/O/sub y/ ultrathin films on Si in a vacuum or in O/sub 2/", Journal of the Electrochemical Society, 148 (12), (December 2001),G695-G703 DING, "Copper Barrier, Seed Layer and Planerization Technologies", VMIC Conference Proceedings, (1997),87-92 FUKUMOTO, HIROFUMI, et al., "Heteroepitaxial growth of Y2O3 films on silicon", Applied Physics Letters, 55(4), (July 24, 1989),360-361 FUYUKI, TAKASHI, et al., "Electronic Properties of the Interface between Si and TiO2 Deposited at Very Low Temperatures", Japanese Journal of Applied Physics, 25(9), (September 1986),1288-1291 GUO, XIN, et al., "High quality ultra-thin (1.5 nm) TiO2-Si3N 4 gate dielectric for deep sub-micron CMOS technology", IEDM Technical Digest. International Electron Devices Meeting, Ctied in related application, (December 5-8, 1999),137-140 IIJIMA, T., "Microstructure and Electrical Properties of Amorphous W-Si-N | | | | |
| vacuum or in O/sub 2/", Journal of the Electrochemical Society, 148 (12), (December 2001),G695-G703 DING, "Copper Barrier, Seed Layer and Planerization Technologies", VMIC Conference Proceedings, (1997),87-92 FUKUMOTO, HIROFUMI, et al., "Heteroepitaxial growth of Y2O3 films on silicon", Applied Physics Letters, 55(4), (July 24, 1989),360-361 FUYUKI, TAKASHI, et al., "Electronic Properties of the Interface between Si and TiO2 Deposited at Very Low Temperatures", Japanese Journal of Applied Physics, 25(9), (September 1986),1288-1291 GUO, XIN, et al., "High quality ultra-thin (1.5 nm) TiO2-Si3N 4 gate dielectric for deep sub-micron CMOS technology", IEDM Technical Digest. International Electron Devices Meeting, Ctied in related application, (December 5-8, 1999),137-140 IIJIMA, T., "Microstructure and Electrical Properties of Amorphous W-Si-N | | | (2002),C57-C59 | |
| vacuum or in O/sub 2/", Journal of the Electrochemical Society, 148 (12), (December 2001),G695-G703 DING, "Copper Barrier, Seed Layer and Planerization Technologies", VMIC Conference Proceedings, (1997),87-92 FUKUMOTO, HIROFUMI, et al., "Heteroepitaxial growth of Y2O3 films on silicon", Applied Physics Letters, 55(4), (July 24, 1989),360-361 FUYUKI, TAKASHI, et al., "Electronic Properties of the Interface between Si and TiO2 Deposited at Very Low Temperatures", Japanese Journal of Applied Physics, 25(9), (September 1986),1288-1291 GUO, XIN, et al., "High quality ultra-thin (1.5 nm) TiO2-Si3N 4 gate dielectric for deep sub-micron CMOS technology", IEDM Technical Digest. International Electron Devices Meeting, Ctied in related application, (December 5-8, 1999),137-140 IIJIMA, T., "Microstructure and Electrical Properties of Amorphous W-Si-N | | | DA ROSA, E.B., et al., "Annealing of ZrAl/sub x/O/sub y/ ultrathin films on Si in a | İ - |
| (December 2001),G695-G703 DING, "Copper Barrier, Seed Layer and Planerization Technologies", VMIC Conference Proceedings, (1997),87-92 FUKUMOTO, HIROFUMI, et al., "Heteroepitaxial growth of Y2O3 films on silicon", Applied Physics Letters, 55(4), (July 24, 1989),360-361 FUYUKI, TAKASHI, et al., "Electronic Properties of the Interface between Si and TiO2 Deposited at Very Low Temperatures", Japanese Journal of Applied Physics, 25(9), (September 1986),1288-1291 GUO, XIN, et al., "High quality ultra-thin (1.5 nm) TiO2-Si3N 4 gate dielectric for deep sub-micron CMOS technology", IEDM Technical Digest. International Electron Devices Meeting, Ctied in related application, (December 5-8, 1999),137-140 IIJIMA, T., "Microstructure and Electrical Properties of Amorphous W-Si-N | 1 | | vacuum or in O/sub 2/", Journal of the Electrochemical Society, 148 (12). | 1 |
| DING, "Copper Barrier, Seed Layer and Planerization Technologies", VMIC Conference Proceedings, (1997),87-92 FUKUMOTO, HIROFUMI, et al., "Heteroepitaxial growth of Y2O3 films on silicon", Applied Physics Letters, 55(4), (July 24, 1989),360-361 FUYUKI, TAKASHI, et al., "Electronic Properties of the Interface between Si and TiO2 Deposited at Very Low Temperatures", Japanese Journal of Applied Physics, 25(9), (September 1986),1288-1291 GUO, XIN, et al., "High quality ultra-thin (1.5 nm) TiO2-Si3N 4 gate dielectric for deep sub-micron CMOS technology", IEDM Technical Digest. International Electron Devices Meeting, Ctied in related application, (December 5-8, 1999),137-140 IIJIMA, T., "Microstructure and Electrical Properties of Amorphous W-Si-N | | | | 1 |
| Conference Proceedings, (1997),87-92 FUKUMOTO, HIROFUMI, et al., "Heteroepitaxial growth of Y2O3 films on silicon", Applied Physics Letters, 55(4), (July 24, 1989),360-361 FUYUKI, TAKASHI, et al., "Electronic Properties of the Interface between Si and TiO2 Deposited at Very Low Temperatures", Japanese Journal of Applied Physics, 25(9), (September 1986),1288-1291 GUO, XIN, et al., "High quality ultra-thin (1.5 nm) TiO2-Si3N 4 gate dielectric for deep sub-micron CMOS technology", IEDM Technical Digest. International Electron Devices Meeting, Ctied in related application, (December 5-8, 1999),137-140 IIJIMA, T., "Microstructure and Electrical Properties of Amorphous W-Si-N | | | | |
| FUKUMOTO, HIROFUMI, et al., "Heteroepitaxial growth of Y2O3 films on silicon", Applied Physics Letters, 55(4), (July 24, 1989),360-361 FUYUKI, TAKASHI, et al., "Electronic Properties of the Interface between Si and TiO2 Deposited at Very Low Temperatures", Japanese Journal of Applied Physics, 25(9), (September 1986),1288-1291 GUO, XIN, et al., "High quality ultra-thin (1.5 nm) TiO2-Si3N 4 gate dielectric for deep sub-micron CMOS technology", IEDM Technical Digest. International Electron Devices Meeting, Ctied in related application, (December 5-8, 1999),137-140 IIJIMA, T., "Microstructure and Electrical Properties of Amorphous W-Si-N | | | Conference Proceedings, (1997),87-92 | |
| silicon", Applied Physics Letters, 55(4), (July 24, 1989),360-361 FUYUKI, TAKASHI, et al., "Electronic Properties of the Interface between Si and TiO2 Deposited at Very Low Temperatures", Japanese Journal of Applied Physics, 25(9), (September 1986),1288-1291 GUO, XIN, et al., "High quality ultra-thin (1.5 nm) TiO2-Si3N 4 gate dielectric for deep sub-micron CMOS technology", IEDM Technical Digest. International Electron Devices Meeting, Ctied in related application, (December 5-8, 1999),137-140 IIJIMA, T., "Microstructure and Electrical Properties of Amorphous W-Si-N | | | | |
| FUYUKI, TAKASHI, et al., "Electronic Properties of the Interface between Si and TiO2 Deposited at Very Low Temperatures", <u>Japanese Journal of Applied Physics</u> , 25(9), (September 1986),1288-1291 GUO, XIN, et al., "High quality ultra-thin (1.5 nm) TiO2-Si3N 4 gate dielectric for deep sub-micron CMOS technology", <u>IEDM Technical Digest</u> . <u>International Electron Devices Meeting</u> , Ctied in related application, (December 5-8, 1999),137-140 IIJIMA, T., "Microstructure and Electrical Properties of Amorphous W-Si-N | \ | | | |
| TiO2 Deposited at Very Low Temperatures", <u>Japanese Journal of Applied Physics</u> , 25(9), (September 1986),1288-1291 GUO, XIN, et al., "High quality ultra-thin (1.5 nm) TiO2-Si3N 4 gate dielectric for deep sub-micron CMOS technology", <u>IEDM Technical Digest</u> . <u>International Electron Devices Meeting</u> , Ctied in related application, (December 5-8, 1999),137-140 IIJIMA, T., "Microstructure and Electrical Properties of Amorphous W-Si-N | | | | |
| Physics, 25(9), (September 1986),1288-1291 GUO, XIN, et al., "High quality ultra-thin (1.5 nm) TiO2-Si3N 4 gate dielectric for deep sub-micron CMOS technology", IEDM Technical Digest. International Electron Devices Meeting, Ctied in related application, (December 5-8, 1999),137-140 IIJIMA, T., "Microstructure and Electrical Properties of Amorphous W-Si-N | | | | |
| GUO, XIN, et al., "High quality ultra-thin (1.5 nm) TiO2-Si3N 4 gate dielectric for deep sub-micron CMOS technology", <u>IEDM Technical Digest. International Electron Devices Meeting</u> , Ctied in related application, (December 5-8, 1999), 137-140 IIJIMA, T., "Microstructure and Electrical Properties of Amorphous W-Si-N | | | Physics, 25(9), (September 1986),1288-1291 | |
| deep sub-micron CMOS technology", <u>IEDM Technical Digest. International Electron Devices Meeting.</u> Ctied in related application, (December 5-8, 1999), 137-140 IIJIMA, T., "Microstructure and Electrical Properties of Amorphous W-Si-N | | • | GUO, XIN, et al., "High quality ultra-thin (1.5 nm) TiO2-Si3N 4 gate dielectric for | |
| Electron Devices Meeting, Ctied in related application, (December 5-8, 1999), 137-140 IIJIMA, T., "Microstructure and Electrical Properties of Amorphous W-Si-N | | İ | | |
| 1999),137-140 IIJIMA, T., "Microstructure and Electrical Properties of Amorphous W-Si-N | | | Electron Devices Meeting, Ctied in related application, (December 5-8. | |
| IIJIMA, T., "Microstructure and Electrical Properties of Amorphous W-Si-N | 1 | | 1999), 137-140 | |
| Barrier Layer for Cu Interconnections", 1996 VMIC Conference, (1996) 168-173 | - A) | | | |
| | , | | Barrier Layer for Cu Interconnections", 1996 VMIC Conference, (1996),168-173 | |

| | 0= | | 11/ |
|----------|------|-----------------|--------|
| EXAMINER | 1/) | DATE CONSIDERED | 3/1/05 |

PTO/S8/084(10-01)
Approved for use through 10/31/2002, OMB 651-0031
US Patent & Trademark Office; U.B. DEPARTMENT OF COMMERCE

| Substitute for form 1449A/PTO | Under the Paperwork Reduction Act of 1995, no persons are Complete if Known | required to respond to a collection of information unless it contains a valid QMB control number |
|---|---|--|
| INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Use as many sheets as necessary) | Application Number | 09/945,535 |
| | Filing Date | August 30, 2001 |
| - 2 | First Named Inventor | Ahn, Kie |
| COPY | Group Art Unit | 2813 |
| Co | Examiner Name | Blum, David . |
| Sheet 4 of 4 | Attorney Docket No: 1 | 303.026US1 |

| | | JEON, SANGHUN, et al., "Ultrathin nitrided-nanolaminate (Al2O3/ZrO2/Al2O3) | |
|--------------------|----------|--|---|
| | | for metal?oxide?semiconductor gate dielectric applications", Journal of Vacuum | |
| $\mid \mathcal{L}$ | 1 | Science & Technology B: Microelectronics and Nanometer Structures, 20(3), | |
| | 7 | (May 2002),1143-5 | |
| | / | KWO, J., et al., "High gate dielectrics Gd2O3 and Y2O3 for silicon", Applied | |
| <u></u> | | Physics Letters, 77(1), (July 3, 2000),130-132 | |
| 1 | | KWO, J., "Properties of high k gate dielectrics Gd2O3 and Y2O3 for Si", | |
| | | Journal of Applied Physics, 89(7), (2001),3920-3927 | ŀ |
| | | LAURSEN, T., "Encapsulation of Copper by Nitridation of Cu-Ti Alloy/Bilayer | |
| 1 1 | | Structures", International Conference on Metallurgical Coatings and Thin Films, | |
| | | Abstract No. H1.03, San Diego, CA,(April 1997),309 | |
| 1] | | LEE, S. J., et al., "Hafnium oxide gate stack prepared by in situ rapid thermal | |
| | ŀ | chemical vapor deposition process for advanced gate dielectrics", Journal of | |
| | | Applied Physics, 92 (5), (September 1, 2002),2807-09 | |
| | | LEE, CHENG-CHUNG, et al., "Ion-assistend deposition of silver films", Thin | |
| | | Solid Films, vol. 359, (2000),95-97 | |
| 1 | | LEE, et al., "Ultrathin Hafnium Oxide with Low Leakage and excellent Reliability | |
| | | fo rAlternative Gae Dielecric Application", IEEE Technical Digest of International | |
| | | Electron Devices Meeting 1999, (1999),133-136 | |
| 1 1 | | LUAN, et al., "High Quality Ta2O5 Gate Dielectrics and T[]", IEEE Technical | |
| | <u>j</u> | Digest of Int. Elec. Devices Mtng 1999, (1999), 141-142 | |
| | | MARTIN, et al., "Ion-beam-assisted deposition of thin films", Applied Optics, | |
| | | 22(1), (1983),178-184 | |
| | | NONE IDENTIFIED, "Improved Metallurgy for Wiring Very Large Scale | |
| | | Integrated Circuits", International Technology Disclosures, vol.4, no.9, | |
| | | (1986),page 2 | |
| | | Ohmi, S, et al, "Rare Earth Metal Oxides for High-K Gate Insulator", | |
| | | Semiconductor Silicon 2002, Vol. 1, Electrochemical Society Proceedings 2002- | |
| | | <u>2,</u> Pg. 376-387. | |
| 1 1 | | RYU, CHANGSUP, "Barriers for Copper Interconnections", Solid State | |
| | | <u>Technology</u> , 42(4), (April 1999),pages 1-3 | |
| | | SMITH, RYAN C., et al., "Chemical Vapour Deposition of the Oxides of Titanium, | |
| | | Zirconium and Hafnium for Use as High-k Materials in Microelectronic Devices. | |
| | | A Carbon-free Precursor for the Synthesis of Hafnium Dioxide", Advanced | |
| | | Materials for Optics and Electronics, 10(3-5), (June 29, 2000),105-14 | |
| | | SOUCHE, D, et al., "Visible and infrared ellipsometry study of ion assisted SiO2 | |
| | | films", Thin Solid Films, 313-314, (1998),676-681 | |
| | | STATHIS, J. H., et al., "Reliability Projection for Ultra-Thin Oxides at Low | |
| المحا | | Voltage", Tech. Dig. International Electron Device Meeting, (1998),167-9 | |
| N | | YAMAMOTO, K., et al., "Effect of Hf metal predeposition on the properties of | |
| ľ | / | sputtered HfO2/Hf stacked gate dielectrics", Applied Physics Letters, 81(11), | |
| | | (September 9, 2002),2053-5 | |
| | | | |

| | | والمراجع والمراجع والمراجع والمراجع والمراجع والمراجع والمراجع والمراجع والمراجع والمراجع والمراجع والمراجع | |
|----------|-----|---|-------|
| EXAMINER | P5- | DATE CONSIDERED | 8/165 |

PTO/SB/084(10-01)
Approved for use through 10/31/2002, OMB 851-0031
US Patent & Trademark Office: U.S. DEPARTMENT OF COMMERCE

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid GMB control number Substitute for form 1449A/PTO Complete if Known INFORMATION DISCLOSURE **Application Number** 09/945535 STATEMENT BY APPLICANT (Use as many sheets as necessary) August 30, 2001 **Filing Date** COPY First Named Inventor Ahn, Kie **Group Art Unit** 2813 Blum, David **Examiner Name** Attorney Docket No: 1303.026US1 Sheet 1 of 8

| | | US P | ATENT DOCUMENT | S | | |
|-----------------------|------------------------|------------------|--|-------|----------|-------------------------------|
| Examiner Initial * | USP Document Number | Publication Date | Name of Patentee or Applicant of cited Document | Class | Subclass | Filing Date If Appropriate |
| 080 | US20010051442A1 | 12/13/2001 | Katsir, D., et al. | 438 | 758 | 06/28/2001 |
| | US20010053082A1 | 12/20/2001 | Chipalkatti, M. H., et al. | 362 | 496 | 12/22/1999 |
| | US20020022156A1 | 02/21/2002 | Bright, C. I. | 428 | 698 | 08/24/2001 |
| | US20020119297 | 08/29/2002 | Forrest, S. R., et al. | 428 | 199 | 12/21/2001 |
| | US20030001241A1 | 01/02/2003 | Chakrabarti, U. K., et al. | 257 | 643 | 05/28/2002 |
| | US-3,381,114 | 04/30/1968 | Nakanuma, Sho | 219 | 385 | 12/18/1964 |
| | US-4,394,673 | 07/19/1983 | Thompson, R. D., et al. | 357 | 15 | 09/29/1980 |
| | US-4,413,022 | 11/01/1983 | Suntola, T, et al. | 427 | 255.2 | 06/21/1979 |
| | US-4,590,042 | 05/20/1986 | Drage, David J. | 422 | 186.06 | 12/24/1984 |
| | US-4,767,641 | 08/30/1988 | Kieser, Jorg, et al. | 427 | 38 | 07/03/1986 |
| | US-4,993,358 | 02/19/1991 | Mahawili, Imad | 118 | 715 | 07/28/1989 |
| | US-5,006,192 | 04/09/1991 | Deguchi, Mikio | 156 | 345 | 11/21/1988 |
| | US-5,055,319 | 10/08/1991 | Bunshah, R. F., et al. | 427 | 38 | 04/02/1990 |
| | US-5,080,928 | 01/14/1992 | Klinedinst, K. A., et al. | 427 | 70 | 10/05/1990 |
| | US-5,198,029 | 03/30/1993 | Dutta, A., et al. | 118 | 303 | 02/19/1992 |
| | US-5,595,606 | 01/21/1997 | Fujikawa, Y., et al. | 118 | 725 | 04/18/1996 |
| | US-5,621,681 | 04/15/1997 | Moon, J | 365 | 145 | 03/22/1996 |
| | US-5,698,022 | 12/16/1997 | Glassman, T. E., et al. | | | 08/14/1996 |
| | US-5,735,960 | 04/07/1998 | Sandhu, Gurtej S., et al. | 118 | 723 IR | 04/02/1996 |
| | US-5,744,374 | 04/28/1998 | Moon, Jong | 437 | 60 | 11/18/1996 |
| | US-5,840,897 | 11/24/1998 | Kirlin, Peter, et al. | 546 | 2 | 06/07/1995 |
| 7 | US-5,916,365 | 01/29/1999 | Sherman, A. | 117 | 92 | 08/16/1996 |
| 7 | US-5,950,925 | 09/14/1999 | Fukunaga, Yukio, et al. | 239 | 132.3 | 10/10/1997 |
| 1 | US-5,972,847 | 10/26/1999 | Feenstra, R., et al. | 505 | 473 | 01/28/1998 |
| | US-6,057,271 | 05/02/2000 | Kenjiro, H., et al. | 505 | 475 | 06/07/1995 |
| | US-6,059,885 | 05/09/2000 | Ohashi, Tadashi , et al. | 118 | 730 | 12/16/1997 |
| | US-6,110,529 | 08/29/2000 | Gardiner, R., et al. | 427 | 250 | 06/07/1995 |
| 7 | US-6,161,500 | 12/19/2000 | Kopacz, Stanislaw , et al. | 118 | 723 E | 09/30/1997 |
| 7 | US-6,203,613 | 03/20/2001 | Gates, S., et al. | 117 | 104 | 10/19/1999 |
| 7 | US-6,206,972 | 03/27/2001 | Dunham, Scott W. | 118 | 715 | 07/08/1999 |
| | US-6,232,847 | 05/15/2001 | Marcy, 5th, H. O., et al. | 331 | 167 | 05/28/1998 |
| | US-6,281,144 | 08/28/2001 | Cleary, Thomas J., et al. | 438 | 780 | 07/15/1999 |
| | US-6,291,866 | 09/18/2001 | Wallace, R. M., et al. | 257 | 410 | 10/20/1999 |
| | US-6,297,516 | 10/02/2001 | Forrest, S. R., et al. | 257 | 40 | 06/25/1999 |
| | US-6,302,964 | 10/16/2001 | Umotoy, Salvador P., et al. | 118 | 715 | 03/16/2000 |
| | US-6,348,386 | 02/19/2002 | Gilmer, D C. | 438 | 288 | 04/16/2001 |
| | US-6,380,579 | 04/30/2002 | Nam, S., et al. | 257 | 306 | 04/11/2000 |
| | US-6,391,769 | 05/21/2002 | Lee, J., et al. | 438 | 643 | 03/14/2000 |
| | US-6,420,279 | 07/16/2002 | Ono, Yoshi , et al. | 438 | 785 | 06/28/2001 |
| C | US-6,432,779 | 08/13/2002 | Hobbs, C., et al. | 438 | 287 | 01/30/2001 |

EXAMINER 050

DATE CONSIDERED

3/1/05

| Substitute for form 1449A/PTO | Complete if Known | required to respond to a collection of information unless it contains a valid CAM3 control number |
|---|---------------------------|---|
| INFORMATION DISCLOSURE STATEMENT BY APPLICANT | Application Number | 09/945535 |
| (Use as many sheets as necessary) | Filing Date | August 30, 2001 |
| | First Named Inventor | Ahn, Kie |
| COL | Group Art Unit | 2813 |
| | Examiner Name | Blum, David |
| Sheet 2 of 8 | Attorney Docket No: 1 | 303.026US1 |

| 054 | US-6,444,039 | 09/03/2002 | Nguyen, Tue | 118 | 715 | 03/07/2000 |
|-----|--------------|------------|----------------------------|-----|-----|------------|
| | US-6,444,895 | 09/03/2002 | Nikawa, K. | 136 | 212 | 09/24/1999 |
| | US-6,445,023 | 09/03/2002 | Vaartstra, Brian , et al. | 257 | 295 | 03/16/1999 |
| | US-6,448,192 | 09/10/2002 | Kaushik, Vidya S. | 438 | 785 | 04/16/2001 |
| | US-6,458,701 | 10/01/2002 | Chae, Y., et al. | 438 | 680 | 10/12/2000 |
| | US-6,482,740 | 11/19/2002 | Soininen, Pekka J., et al. | 438 | 686 | 05/15/2001 |
| V | US-6,514,828 | 02/04/2003 | Ahn, Kie Y., et al. | 438 | 297 | 04/20/2001 |
| V | US-6,534,420 | 03/18/2003 | Ahn, Kie Y., et al. | 438 | 768 | 07/18/2001 |

| | FOREIGN PATENT DOCUMENTS | | | | | |
|-----------------------|--------------------------|------------------|---|-------|----------|----------------|
| Examiner Initials* | Foreign Document No | Publication Date | Name of Patentee or Applicant of cited Document | Class | Subclass | T ² |
| 92 | JP-5090169 | 04/09/1993 | Watanabe, Kunihiko , et al. | | | |
| V | JP-62-199019 | 09/02/1987 | Takaaki, Sasaki | | | |

| | OTHER | R DOCUMENTS NON PATENT LITERATURE DOCUMENTS | |
|-----------------------|-------------------------|---|---|
| Examiner Initials* | Cite No ¹ | Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published. | T |
| 25 | | AARIK, J, et al., Thin Solid Films, 340, (1999),110-116 | |
| | | AARIK, JAAN, et al., "Atomic layer growth of epitaxial TiO/sub 2/ thin films from TiCl/sub 4/ and H/sub 2/O on alpha -Al/sub 2/O/sub 3/ substrates", <u>Journal of Crystal Growth</u> , vol.242, no.1-2, (2002),189-198 | |
| | | AARIK, JAAN, et al., "Phase transformations in hafnium dioxide thin films grown by atomic layer doposition at high temperatures", <u>Applied Surface Science</u> , 173, (2001),15-21 | |
| | | AARIK, JAAN, et al., "Texture Development in nanocrystalline hafnium dioxide thin films grown by atomic layer deposition", <u>Journal of Crystal Growth</u> , 220, (2000),105-113 | |
| | | ALEN, PETRA, et al., "Atomic Layer deposition of Ta(Al)N(C) thin films using trimethylaluminum as a reducing agent", <u>Journal of the Electrochemical Society</u> , vol.148, no.10, (October 2001),G566-G571 | |
| | | BENDORAITIS, J G., et al., <u>Jour. Phys. Chem., 69(10)</u> , (1965),3666-3667 | |
| | | BUNSHAH, ROINTAN F., et al., "Deposition Technologies for Films and Coatings: Developments and Applications", Noyes Publications, 102-103 | |
| | | CAVA, R J., et al., "Improvement of the dielectric properties of Ta/sub 2/O/sub 5/ through substitution with Al/sub 2/O/sub 3/", Applied Physics Letters, vol.70, no.11, (March 1997),1396-8 | |
| | | COPEL, M., et al., "Structure and stability of ultrathin zirconium oxide layers on Si(001)", Applied Physics Letters, Vol 76, No. 4, (January 2000),436-438 | |
| | | DE FLAVIIS, FRANCO, et al., "Planar microwave integrated phase-shifter design with high purity ferroelectric material", <u>IEEE Transactions on Microwave Theory & Techniques</u> , vol.45, no.6, (June 1997),963-969 | |
| V | | DESU, S.B., "Minimization of Fatigue in Ferroelectric Films", Phys. Stat. Sol. (a) 151, (1995),467-480 | |

| EXAMINER | DSA | DATE CONSIDERED | 3/1/05 |
|----------|-----|-----------------|--------|

PTO/SB084(10-01)
Approved for use through 10/31/2002, OMB 651-0001
US Patent & Trademan Office U.S. DEPARTMENT OF COMMERCE
on of information under the particle of the Comment of the Comm

| 0.5-19.5-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1 | Under the Peperwork Reduction Act of 1995, no persons are | required to respond to a collection of information untess it contains a valid OMB control number |
|--|---|--|
| Substitute for form 1449A/PTO INFORMATION DISCLOSURE | Complete if Known | |
| STATEMENT BY APPLICANT (Use as many sheets as necessary) | Application Number | 09/945535 |
| | Filing Date | August 30, 2001 |
| | First Named Inventor | Ahn, Kie |
| COP' | Group Art Unit | 2813 |
| | Examiner Name | Blum, David |
| | Attornov Dooket No. 1 | 202 026164 |
| Sheet 3 of 8 | Attorney Docket No: 1 | 303.020031 |

| | OTHER | R DOCUMENTS NON PATENT LITERATURE DOCUMENTS | |
|--------------------|--------------|---|----|
| Examiner initials* | Cite No 1 | Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-Issue number(s), publisher, city and/or country where published. | T² |
| DST | | DUSCO, C, et al., "Deposition of tin oxide into porous silicon by atomic layer epitaxy", J. Electrochem. Soc., 143, (1996),683-687 | |
| | | EL-KAREH, B, et al., "The evolution of DRAM cell technology", Solid State Technology, (1997),89 | |
| | | ENGELHARDT, M., "Modern Applications of Plasma Etching and Patterning in | |
| | | Silicon Process Technology", Contrib. Plasma. Phys., 39(5), (1999),473-478 FORSGREN, K, Comprehensive Summaries of Uppsala Dissertation from the | |
| | | Faculty of Science and Techonology, 665, (2001),37 FORSGREN, KATARINA, et al., "Atomic Layer Deposition of HfO2 using | |
| | | hafnium iodide", Conference held in Monterey, California, (May 2001),1 page | |
| | | FUYUKI, TAKASHI, et al., "Electronic Properties of the Interface between Si and TiO2 Deposited at Very Low Temperatures", <u>Journal of Applied Physics</u> , (1986),1288-1291 | |
| | | GARTNER, M, et al., "Spectroellipsometric characterization of lanthanide-doped TiO2 films obtained via the sol-gel technique", Thin Solid Films, (1993),561-565 | |
| | | GELLER, S., et al., "Crystallographic Studies of Perovskite-like Compounds. II. Rare Earth Aluminates", Acta Cryst. Vol. 9, (May 1956),1019-1025 | |
| | | GIESS, E. A., et al., "Lanthanide gallate perovskite-type substrates for epitaxial, high-Tc superconducting Ba2YCu3O7- films", IBM J. Res. Develop. vol. 34, No. 6, (November 1990),916-926 | |
| | | GUILLAMOT, B, et al., <u>Technical Digest of International Electron Devices</u> <u>Meeting 2002</u> , (2002),355-358 | |
| | | GUSEV, E P., et al., "Ultrathin High-K Dielectrics Grown by Atomic Layer Deposition: A Comparative Study of ZrO2, HfO2, Y2O3 and Al2O3", Electrochemical Society Proceedings Volume 2001-9, (2001),189-195 | |
| | | GUTOWSKI, M J., J. Appl. Phys., 80, (2002),1897-1899 | |
| | | HUNT, C. E., et al., "Direct bonding of micromachined silicon wafers for laser diode heat exchanger applications", J. Micromech. Microeng., 1, (1991),152-156 | |
| | | IDDLES, D M., et al., "Relationships between dopants, microstructure and the microwave dielectric properties of ZrO2-TiO2-SnO2 ceramics", <u>Journal of Materials Science</u> , Vol. 27, (1992),6303-6310 | |
| | | JEON, SANGHUN, et al., "Excellent Electrical Characteristics of Lanthanide (Pr, Nd, Sm, Gd, and Dy) Oxide and Lanthanide-doped Oxide for MOS Gate Dielectric Applications", Technical Digest of IEDM, (2001),471-474 | |
| | | JUNG, H S., et al., <u>Technical Digest of International Electron Devices Meeting</u> 2002, (2002),853-856 | |
| | | KANG, L, et al., <u>Tech. Dig. Int. Electron Devices Meet.</u> , 2000, (2000),35 | |
| | | KEOMANY, D., et al., "Sol gel preparation of mixed cerium-titanium oxide thin films", Sol. Energy Mater. So. Cells, 33,(1994),pp. 429-441 | |
| 0 | | KIM, Y W., et al., <u>Technical Digest of International Electron Devices Meeting</u> 2002, (2002),69-72 | |

| EXAMINER | 05 | DATE CONSIDERED | 0/2/05 | |
|----------|----|-----------------|----------|--|
| | | | - 1 10 - | |

PTO/S8/084(10-01)
Approved for use through 10/31/2002, CAMB 651-0031
US Petervià Trademan Office; U.S. (EPARTNEWT OF COALERGE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMG control number. Substitute for form 1449A/PTO Complete if Known INFORMATION DISCLOSURE **Application Number** 09/945535 STATEMENT BY APPLICANT (Use as many sheets as necessary) Filing Date August 30, 2001 **First Named Inventor** Ahn, Kie **Group Art Unit** 2813 **Examiner Name** Blum, David Attorney Docket No: 1303.026US1 Sheet 4 of 8

| Examiner Initials* Cite No¹ Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published. KIM, D., et al., "Atomic Control of Substrate Termination and Heteroepitaxial Growth of SrTiO3/LaAlO3 Films", Journal of the Korean Physical Society Vol. 36 No.6, (06/2000),444-448 KIM, BYOUNG-YOUP, et al., "Comparison study for TiN films deposited from different method: chemical vapor deposition and atomic layer deposition", Mechanisms of Surface and Microstructure Evolution in Deposited Films and Film Structures Symposium (Materials Research Society Symposium |
|--|
| Growth of SrTiO3/LaAlO3 Films", <u>Journal of the Korean Physical Society Vol. 36 No.6</u> , (06/2000),444-448 KIM, BYOUNG-YOUP, et al., "Comparison study for TiN films deposited from different method: chemical vapor deposition and atomic layer deposition", <u>Mechanisms of Surface and Microstructure Evolution in Deposited Films and</u> |
| No.6, (06/2000),444-448 KIM, BYOUNG-YOUP, et al., "Comparison study for TiN films deposited from different method: chemical vapor deposition and atomic layer deposition", Mechanisms of Surface and Microstructure Evolution in Deposited Films and |
| KIM, BYOUNG-YOUP, et al., "Comparison study for TiN films deposited from different method: chemical vapor deposition and atomic layer deposition", Mechanisms of Surface and Microstructure Evolution in Deposited Films and |
| different method: chemical vapor deposition and atomic layer deposition", Mechanisms of Surface and Microstructure Evolution in Deposited Films and |
| Mechanisms of Surface and Microstructure Evolution in Deposited Films and |
| |
| |
| Proceedings Vol.672), (2001),7.8.1-7.8.6 |
| KIM, TAESEOK, et al., "Correlation between strain and dielectric properties in |
| ZrTiO/sub 4/ thin films", Applied Physics Letters, vol.76, no.21, (May 2000),3043- |
| 3045 |
| KIM, TAESEOK, et al., "Dielectric properties and strain analysis in paraelectric |
| ZrTiO/sub 4/ thin films deposited by DC magnetron sputtering", <u>Japanese</u> |
| Journal of Applied Physics Part 1-Regular Papers Short Notes & Review Papers, |
| vol.39, no.7A, (2000),4153-4157 |
| KIM, YONGJO, et al., "Effect of microstructures on the microwave dielectric |
| properties of ZrTiO/sub 4/ thin films", Applied Physics Letters, vol.78, no.16, |
| (April 2001),2363-2365 |
| KRAUTER, G., et al., "Room Temperature Silicon Wafer Bonding with Ultra-Thin |
| Polymer Films", <u>Advanced Materials</u> , <u>9(5)</u> , (1997),417-420 |
| KUKLI, K J., et al., <u>J. Appl. Phys., 80,</u> (2002),5698-5703 |
| KUKLI, K, et al., Thin Solid Films, 416, (2002),72-79 |
| KUKLI, KAUPO, et al., "Atomic Layer Deposition of Titanium Oxide Til4 and H2O2", Chem. Vap. Deposition, Vol. 6, No. 6, (2000),303-310 |
| KUKLI, K, et al., "Controlled Growth of Yttrium Oxysulphide Thin Films by |
| Atomic Layer Deposition", Materials Science Forum, (1999),216-221 |
| KUKLI, KAUPO, et al., "Dielectric Properties of Zirconium Oxide Grown by |
| Atomic Layer Deposition from Iodide Precursor", <u>Journal of The Electrochemical</u> |
| Society, 148(12), (2001),F227-F232 |
| KUKLI, K , et al., "Influence of thickness and growth temperature on the |
| properties of zirconium oxide films growth by atomic layer deposition on silicon", |
| Thin Solid Films, 410, (2002),53-60 |
| LEE, B H., et al., Tech. Dig. Int. Electron Devices Meet., 2000, (2000),39 |
| LEE, S J., et al., Tech. Dig. Int. Electron Devices Meet., 2000, (2000),31 |
| LEE, J H., et al., <u>Technical Digest of International Electron Devices Meeting</u> 2002, (2002),221-224 |
| LEE, A E., et al., "Epitaxially grown sputtered LaAlO3 films", Appl. Phys. Lett. 57 |
| (19), (November 1990),2019-2021 |
| LEE, CHENG-CHUNG, et al., "lon-assisted deposition of silver thin films", Thin |
| Solid Films, 359,(2000),pp. 95-97 |

| EXAMINER | 6/5 | DATE CONSIDERED | 3/1/05 |
|----------|-----|-----------------|--------|

PTO/SB/084(10-01)
Approved for use through 10/31/2002, OMB 651-0031
US Patent & Trademerk Office: U.S. DEPARTIÇENT OF COMMERCE

| Substitute for form 1449A/PTO INFORMATION DISCLOSURE | Complete if Known | | |
|--|---------------------------|-----------------|--|
| STATEMENT BY APPLICANT | Application Number | 09/945535 | |
| (Use as many sheets as necessary) | Filing Date | August 30, 2001 | |
| | First Named Inventor | Ahn, Kie | |
| COPY | Group Art Unit | 2813 | |
| | Examiner Name | Blum, David | |
| Sheet 5 of 8 | Attorney Docket No: 1 | 303.026US1 | |

| | LEE, DONG H., et al., "Metalorganic chemical vapor deposition of Tio2:n | |
|------------------|---|---|
| | anatase thin film on Si substrate", Applied Physics Letters, (February 1995),pp. | |
| 1 Be | 815-816 | |
| | LEE, L P., et al., "Monolithic 77 K dc SQUID magnetometer", Appl. Phys. Lett. | |
| | 59(23), (December 1991),3051-3053 | |
| | LEE, C. H., et al., "MOS Characteristics of Ultra Thin Rapid Thermal CVD ZrO2 | _ |
| | and Zr Silicate Gate Dielectrics", IEDM. (2000),pp. 27-30 | |
| | LEE, C H., et al., "MOS Devices with High Quality Ultra Thin CVD ZrO2 Gate | |
| | Dielectrics and Self-Aligned TaN and TaN/Poly-Si Gate electrodes", 2001 | |
| | Symposium on VLSI, Technology Digest of Technical Papers, (2001),137-138 | |
| | LEE, BYOUNG H., et al., "Ultrathin Hafnium Oxide with Low Leakage and | |
| | Excellent Reliability for Alternative Gate Dielectric Application", Technical Digest | |
| | of IEDM, (1999),133-136 | |
| | LUCOVSKY, G, et al., "Microscopic model for enhanced dielectric constants in | |
| | low concentration SiO2-rich noncrystalline Zr and Hf silicate alloys", Applied | |
| | Physics Letters, (October 2000),2912-2914 | |
| | LUO, Z J., et al., "Ultra-thin ZrO2 (or Silicate) with High Thermal Stability for | |
| | CMOS GAte Applications", 2001 Symposium on VLSI Technology Digest of | |
| | <u>Technical Papers</u> , (2001),135-136 | |
|]]] | MOLODYK, A A., et al., "Volatile Surfactant-Assisted MOCVD: Application to | |
| | LaAl03 Thin Film Growth", Chem. Vap. Deposition Vol. 6, No. 3, (2000),133-138 | |
| | MOLSA, HEINI, et al., "Growth of Yttrium Oxide Thin Films from B-Diketonate | |
| | Precursor", Advanced Materials for Optics and Electronics, (1994),389-400 | |
| | NAKAGAWARA, OSAMU, et al., "Electrical properties of (Zr, Sn)TiO4 dielectric | |
| | thin film prepared by pulsed laser deposition", <u>J. Appl. Phys., 80(1),</u> (July | |
| | 1996),388-392 | |
| | NAKAJIMA, ANRI , et al., "Atomic-layer deposition of ZrO/sub 2/ with a Si nitride | |
| | barrier layer", Applied Physics Letters, vol.81, no.15, (October 2002),2824-2826 | |
|] | NAKAJIMA, ANRI , et al., "NH3-annealed atomic-layer-deposited silicon nitride | |
| | as a high-k gate dielectric with high reliability", Applied Physics Letters, | |
| | (February 2002),1252-1254 | |
| | NEUMAYER, D A., et al., "Materials characterization of ZrO2-SiO2 and HfO2- | |
| | SiO2 binary oxides deposited by chemical solution deposition", <u>Journal of</u> | |
| | Applied Physics, (August 2001),1801-1808 | |
| | NILISK, A, et al., "Atomic-scale optical monitoring of the initial growth of TiO2 | |
| | thin films", Int. Soc. Opt. Eng., 431, (2001),72-77 | |
| | OATES, D E., et al., "Surface impedance measurements of YBa/sub 2/Cu/sub | |
| | 3/O/sub 7-x/ thin films in stripline resonators", <u>IEEE Transactions on Magnetics</u> , | |
| | vol.27, no.2, pt.2, (March 1991),867-871 | |
| | OH, C B., et al., Technical Digest of International Electron Devices Meeting | |
| ├──₩ ─├── | 2002, (2002),423-426 | |
| L | PARK, J J., et al., J. of the Electrochemical Soc., 149, (2002),G89-G94 | |

| | _ | | |
|----------|----|-----------------|---------|
| EXAMINER | Dz | DATE CONSIDERED | 3/7/05 |
| | | | - • • • |

PTO/S908A(10-01)
Approved for use through 10/31/2022, OMS 651-0031
US Patent & Trademark Office: U.S. DEFARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMS control number.

Complete if Known Substitute for form 1449A/PTO INFORMATION DISCLOSURE Complete if Known 09/945535 **Application Number** STATEMENT BY APPLICANT (Use as many sheets as necessary) August 30, 2001 Filing Date Ahn, Kie **First Named Inventor** 2813 **Group Art Unit Examiner Name** Blum, David Attorney Docket No: 1303.026US1 Sheet 6 of 8

| | PARK, BYUNG-EUN, et al., "Electrical properties of LaAlO3/Si and | |
|-----|---|---|
| 10 | Sr0.8Bi2.2Ta2O9/LaAlO3/Si structures", Applied Physics Letters, Vol. 79, No. 6, | |
| 185 | (August 2001),806-808 | |
| | PERKINS, CHARLES M., et al., "Electrical and materials properties of ZrO2 gate | |
| | dielectrics grown by atomic layer chemical vapor deposition", Applied Physics | |
| | Letters, Vol. 78, No. 16, (April 2001),2357-2359 | |
| | POVESHCHENKO, V P., et al., Sov. J. Opt. Technol., 51, (1984),277-279 | |
| | QI, WEN-JIE, et al., "Performance of MOSFETs with ultra thin ZrO2 and Zr- | |
| | silicate gate dielectrics*, 2000 Symposium on VLSI Technology, Digest of | |
| | Technical Papers, (2000),40-41 | |
| | RAMAKRISHNAN, E.S., et al., "Dielectric Properties of Radio Frequency | |
| | Magnetron Sputter Deposited Zirconium Titanate-Based Thin Films", J. | |
| | Electrochem. Soc., Vol. 145, No. 1, (January 1998),358-362 | |
| | RAYNER JR., G, et al., "The Structure of Plasma-Deposited and Annealed | |
| | Pseudo-Binary ZrO2-SiO2 Alloys", Material Res. Soc. Symp., (2000),C1.3.1- | |
| | C1.3.9 | |
| | RITALA, MIKKO, "Atomic Layer Epitaxy Growth of Titanium, Zirconium and | |
| | Hafnium Dioxide Thin Films", Annales Academiae Scientiarum Fennicae, | |
| | (1994),24-25 | |
| | RITALA, MIKKO, et al., "Zirconium dioxide thin films deposited by ALE using | |
| | zirconium tetrachloride as precursor", Applied Surface Science, Vol. 75, | |
| | (1994),333-340 | |
| | ROBERTSON, J., "Band offsets of wide-band-gap oxides and implications for | |
| | future electronic devices", Journal Vac. Sci. Technol. B, 18(3), (2000),pp. 1785- | |
| | 1791 | |
| | ROSSNAGEL, S M., et al., "Plasma-enhanced atomic layer deposition of Ta and | |
| | Ti for Interconnect diffusion barriers", <u>J. Vac. Sci. & Techno., B, 18,</u> (2000),2016- | |
| | 2020 | |
| | ROTONDARO, A L., et al., "Advanced CMOS Transistors with a Novel HfSiON | |
| | Gate Dielectric", Symposium on VLSI Technology Digest of Technical Papers, | |
| | (2002),148-149 | |
| | SHANWARE, A, et al., "Reliability evaluation of HfSiON gate dielectric film with | |
| | 12.8 A SiO2 equivalent thickness", International Electron Devices Meeting. | |
| | (2001),137-140 | |
| | SNEH, OFER, "Thin film atomic layer deposition equipment for semiconductor | |
| | processing", Thin Solid Films, vol.402, no.1-2, (January 2002),248-261 |] |
| | SONG, HYUN-JUNG, et al., "Atomic Layer Deposition of Ta2O5 Films Using | |
| Δ | Ta(OC2H5)5 and NH3", Mat. Res. Soc. Symp. Proc., (1999),469-471 | |

| EXAMINER | 05 | DATE CONSIDERED | 3/7/05 |
|----------|----|-----------------|--------|

PTC/SB/08A(10-01)
Approved for use through 10/21/2002. Olde 55-10-031
US Patient & Trademark Office: U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Complete if Known Substitute for form 1449A/PTO Complete if Known INFORMATION DISCLOSURE 09/945535 **Application Number** STATEMENT BY APPLICANT August 30, 2001 (Use as many sheets as necessary) **Filing Date** COP **First Named Inventor** Ahn, Kie **Group Art Unit** 2813 Blum, David **Examiner Name** Attorney Docket No: 1303.026US1 Sheet 7 of 8

| | CHATOLA T "Atomic Lover Entroyal Headhack of Createl Croudb 2: This | |
|----------|--|--|
| | SUNTOLA, T., "Atomic Layer Epitaxy", Handbook of Crystal Growth, 3; Thin | |
| 1KB | Films of Epitaxy, Part B: Growth Mechanics and Dynamics, | |
| V - 1 | Amsterdam,(1994),pp. 602-663 | |
| | SUNTOLA, T, "Atomic layer epitaxy", Thin Solid Films, 216, (1992),84-89 | |
| | TAKEMOTO, J. H., et al., "Microstrip Resonators and Filters Using High-TC | |
| | Superconducting Thin Films on LaAlO3", <u>IEEE Transaction on Magnetics, Vol.</u> | |
| | 27, No. 2, (March 1991),2549-2552 | |
| | TARRE, A , et al., "Comparative study of low-temperature chloride atomic-layer | |
| | chemical vapor deposition of TiO2 and SnO2", Applied Surface Science, | |
| | (2001),111-116 | |
| | TAVEL, B, et al., <u>Technical Digest of International Electron Devices Meetings</u> | |
| | 2002, (2002),429-432 | |
| | VAN DOVER, R. B., et al., "Amorphous lanthanide-doped TiOx dielectric films", | |
| | Applied Physics Letters, Vol. 74, No. 20,(May 17, 1999),pp. 3041-3043 | |
| | VAN DOVER, ROBERT B., et al., "Deposition of Uniform Zr-Sn-Ti-O films by | |
| | ON-Axis Reactive Sputtering", <u>IEEE Electron Device Letters</u> , Vol. 19, No. 9, | |
| | (September 1998),329-331 | |
| | VAN DOVER, R. B., et al., "Discovery of a useful thin-film dielectric using a | |
| | composition-spread approach", Letters to Nature, (1997),3 pages | |
| | VIIROLA, H, et al., "Controlled growth of antimony-doped tin dioxide thin films | |
| | by atomic layer epitaxy", Thin Solid Films, (1994),127-135 | |
| · | VIIROLA, H, "Controlled growth of tin oxide thin films by atomic layer epitaxy", | |
| | Thin Solid Films, (1994),144-149 | |
| | VISOKAY, M R., et al., "Application of HfSiON as a gate dielectric material", | |
| | Applied Physics Letters, (April 2002),3183-3185 | |
| | VON DOVER, R B., et al., "Deposition of Uniform Zr-Sn-Ti-O Films by On-Axis | |
| | Reactive Sputtering", IEEE Electron Device Letters, 19, (1998),1998 | |
| | WILK, G D., et al., "Hafnium and zirconium silicates for advanced gate | |
| | dielectrics", <u>Journal of Applied Physics</u> , (January 2000),484-492 | |
| | WILK, G. D., et al., "High-K gate dielectrics: Current status and materials | |
| | properties considerations", <u>J. Appl. Phys., vol. 89, No. 10,</u> (May 2001),5243- | |
| | 5275 | |
| | WOLFMAN, G, et al., "Existence range, structural and dielectric properties of | |
| | ZrxTiySnzO4 ceramics (x + y =2)", Mat. Res. Bull., 16, (1981),1455 | |
| | YAMAGUCHI, TAKESHI, et al., "Band Diagram and Carrier Conduction | |
| | Mechanism in ZrO2/Zr-silicate/Si MIS Structure Fabricated by Pulsed-laser- | |
| | ablation Deposition", IEDM, (2000),19-22 | |
| | YAMAGUCHI, TAKESHI, et al., "Study on Zr-Silicate Interfacial Layer of ZrO2- | |
| \vee | MIS Structure FAbricated by Pulsed Laser Ablation Deposition Method", Solid | |
| | State Devices and Materials, (2000),228-229 | |

| | //10 | | |
|----------|----------|-----------------|--------|
| | 1/52 | | -1/- |
| EXAMINER | | DATE CONSIDERED | 517162 |
| | <i>V</i> | -: ·· | , - |

PTO/SB084(10-01)
Approved for use through 1003/12002, OAB 63-10001
US Petert & Tradement Office: U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no paraons are required to respond to a collection of information unless it contains a valid OMB control number. Substitute for form 1449A/PTO
INFORMATION DISCLOSURE Complete if Known **Application Number** 09/945535 STATEMENT BY APPLICANT (Use as many sheets as necessary) August 30, 2001 **Filing Date** COP **First Named Inventor** Ahn, Kie 2813 **Group Art Unit Examiner Name** Blum, David Attorney Docket No: 1303.026US1 Sheet 8 of 8

| 0507 | ZHANG, H., "Atomic Layer Deposition of High Dielectric Constant Nanolaminates", <u>Journal of The Electrochemical Society</u> , 148(4),(April, 2001),F63-F66 | |
|------|--|--|
| | ZHANG, H, et al., "High permittivity thin film nanolaminates", <u>Journal of Applied Physics</u> , Vol. 87, No. 4, (February 2000),1921-1924 | |
| | ZHU, W, et al., "HfO2 and HfAIO for CMOS: Thermal Stability and Current Tranport", IEEE International Electron Device Meeting 2001, (2001),463-466 | |
| V | ZUCKER, O, et al., "Application of Oxygen Plasma Processing to Silicon Direct Bonding", Sensors and Actuators A, 36, (1993),227-231 | |